VOLUNTARY REMEDIATON WORK PLAN
FORMER DOCK-N-SHOP SITE
PRIEST RIVER, IDAHO

Submitted to:

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December 27, 2007 073-93443

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1.0 INTRODUCTION

1.1 PURPOSE AND INTENT

JLZ Enterprises (JLZ) has prepared this Voluntary Remediation Work Plan (Work Plan) in response to entering into the Voluntary Cleanup Program (VCP) in order to address soil and groundwater petroleum impacts at the Former Dock N Shop Site (Site). The current owner, JLZ, plans to remediate the remaining soil and groundwater petroleum impacts at the Site as part of site re-development activities. Site soil contamination and groundwater impacts will be assessed through the Idaho Risk Evaluation Manual (REM) process. Golder Associates Inc. (Golder), on behalf of JLZ, has developed this Work Plan for the Site presenting remedial options for those areas on the Site that require remediation in accordance with the Idaho Remediation Standards referenced in IDAPA 58.01.18.023.

The Site is currently under a Consent Order with IDEQ to clean up site soil and groundwater petroleum impacts resulting from a leaking underground storage tank (LUST) reported in May 2003 by Albar to the Idaho Department of Environmental Quality (IDEQ). The leak occurred at the bottom of a 4,000 gallon Underground Storage Tank (UST) situated at the 10 to 11 foot depth interval and released approximately 1,200 gallons of unleaded gasoline to the site subsurface. Following Kleinfelder's initial response efforts to clean up petroleum contaminated soils (PCS) and petroleum contaminated groundwater resulting from the LUST in 2003, an in-situ remediation system was designed and installed in 2004 and is currently operating at the Site.

In August 2007, JLZ performed a tank removal action to properly remove and close the two remaining UST's and the associated dispenser piping at the Site. As a condition for participation in the VCP, JLZ entered into a Voluntary Remediation Agreement (VRA) with IDEQ in October 2007 for the purpose of implementing a risk-based remedial action at the Site. The VRA for the site is included in Appendix A.

The intent of this work plan is to excavate and remove the remaining PCS from the site to target levels based on Idaho's REM process. Site excavation and PCS removal efforts will focus on the "*smear zone*" in the 15 to 20 foot depth interval and the area in and around the active in-situ remediation system. This excavation and off-site disposal action is intended to effectively and completely remove the remaining PCS from the site that contains petroleum hydrocarbon impacts as a result of the reported LUST in 2003. Following PCS excavation and removal, groundwater will be monitored as long as necessary in order to effectively demonstrate to IDEQ that site groundwater cleanup criteria have been achieved and ensure that surface waters of the Pend Oreille River are not degraded.

2.0 REVIEW AND ANALYSIS OF AVAILABLE DATA

2.1 INTRODUCTION

The Site is currently under a Consent Order with IDEQ to clean up site soil and groundwater petroleum impacts resulting from a LUST reported by Albar to IDEQ in May 2003. As a result of the reported LUST in 2003, an in-situ remediation system was designed and installed in 2004. This remediation system consists of a soil vapor extraction system (SVE), groundwater air sparging system (AS) and total fluids air-stripper treatment system (TFTS). The in-situ remediation system has operated intermittently on the site from 2004 through 2007.

This Work Plan includes the results of the Release Investigation Report (Kleinfelder, 2004), RBCA Corrective Action Plan Report (Kleinfelder, 2005), Quarterly Groundwater Monitoring Progress Reports conducted by Kleinfelder between 2004 and 2007 under contract with the previous owner of the Site (Al Sudau) and the Petroleum Storage Tank Fund (PSTF), Soil Boring Investigation (Kleinfelder, 2006), and Tank Removal Report (Golder, 2007). These reports discuss the tank removal activities, soil excavation, groundwater treatment results, and soil investigation activities performed between 2003 to the present in response to the reported LUST in 2003.

Copies of these reports may be viewed at the IDEQ regional office in Coeur d'Alene and the Priest River Public Library.

2.2 SITE DESCRIPTION AND LAND USE

2.2.1 Site Location and Surrounding Properties

The Site is located at 208 Railroad Avenue in the city of Priest River, Bonner County, Idaho shown in Figure 1. This property is a 0.5 acre parcel and is currently owned by JLZ Enterprises. The site is currently not used for any commercial or residential activities. The Site is situated on the northern bank of the Pend Oreille River and includes the bluff extending to the high water level in the river as well as a floating dock and marina extending nearly 75 feet out into the river from the shoreline.

The Site is bordered to the west by Wisconsin Avenue and the City of Priest River Wastewater Treatment Facility. Adjacent to the north of the Site is an active Burlington Northern-Santa Fe Railroad main line. Immediately to the east of the Site is a vacant residential dwelling and the Priest River Yacht Club. Farther east is the City of Priest River Public Beach. The Pend Oreille River borders the Site to the south.

2.2.2 Current and Historic Land Use

Golder has compiled the following historical summary of the Site based on information gathered from agency files, including a thorough environmental database review performed by *Environmental Data Resources*, observations of Sanborn maps dating back to 1903, aerial photographs back dating to 1981, topographic maps dating back to 1968, and previous investigations by Kleinfelder and Tracer Research Corp.

The Site currently contains no operating buildings, other than a wooden storage shed located on the marina boardwalk along the river bank on the southern edge of the property. Additionally, a wooden dock and floating marina are situated along the southern portion of the Site. The dock extends approximately 75 feet out over the Pend Oreille River.

In 1903, the Site was located along the southern boundary of the Main Line of the Great Northern Railroad running through the town of Priest River. Seven structures occupied the site, including the St. Elmo Hotel, three single-level dwellings, one Saloon, and two storage buildings. The St. Elmo Hotel was located on the northwest corner of the Site. The Site was situated adjacent to the switch line tracks of the railroad. This switch line was an arbitrary roadway formerly known as South Montgomery Street that ran along the top of the northern bluff-line of the former Pend Oreille River.

By 1928, an Auto Garage had been constructed on the southern portion of the property along the bluff of the Pend Oreille River, and existed through the 1960s. Two additional single-story buildings were constructed on the central portion of the Site in the 1920s, and an Ice Shed was located on the western boundary of the site.

In 1982, the Former Doc-N-Shop buildings were constructed on the Site, consisting of a convenience store, a restaurant, a storage building, a marina boardwalk, and three unleaded gasoline USTs connected to three fuel pumps. Two of the fuel pumps were located on a pump island near the road and one of the pumps was located on a dock situated on the Pend Oreille River. This facility operated as a car and boat fueling facility and a commercial store/restaurant from 1982 though May 2003.

In September 2005, Mrs. Echo VanderWal of JLZ purchased the property from Al Sudau.

2.2.3 Future Land Use

JLZ has prepared a plan for future re-development of the site for mixed-use, multi-tenant residential housing units (see Appendix B – Proposed Site Re-development Plan, Better Sites Design Service). The Site is currently zoned commercial by the City of Priest River. However, JLZ wishes to construct residential condominiums on the site that will connect to municipal facilities of the City of Priest River, including potable water and sanitary sewer.

2.3 WATER USE

2.3.1 Current Use of On-Site Groundwater and Surface Water

Currently, there is no use of onsite groundwater or surface waters. The Site is located within the city limits of the City of Priest River and receives City municipal services including drinking water and sanitary sewer. Although, the Former Dock N Shop buildings were previously connected to the City drinking water and sewer lines, no services other than electricity are currently hooked up or used on the site.

2.3.2 Future Use of On-Site Groundwater and Surface Water

No groundwater production wells currently exist on the site, and there are no future plans to use the site groundwater for residential or commercial activities. Any future structures and dwellings constructed on the Site will be connected directly to City municipal water supply and sanitary sewer. The Site water requirements as well as those of the adjacent and surrounding properties are expected to continue to use municipal water supply for the foreseeable future.

2.4 SITE GEOLOGY AND SOIL STRATIGRAPHY

2.4.1 Site Topography and Surface Hydrology

The Site property is relatively flat from the Railroad Ave to the top of the bluff of the Pend Oreille River. The bluff is a steep, vegetated slope with a grade of 1H:2V (Horizontal:Vertical). This slope has a vertical distance to the Pend Oreille River of approximately 15 feet during high water periods and as much as 25 feet during low flow river conditions of the Pend Oreille River, as controlled by the Albeni Falls Dam (located approximately 5 miles down river).

Stormwater on the northern portion of the Site is directed southward towards the river by sheet flow across the asphalt pavement. A stormwater drain was previously located near the center of the Site and connected to a subsurface drainpipe leading to the bluff and discharging to the Pend Oreille River. Stormwater on the southern unpaved portion of the Site infiltrates directly into the ground and percolates downward.

2.4.2 Regional Geology

The Pend Oreille River channel was established by massive floods discharged from Glacial Lake Missoula during the Pleistocene Period (10,000 to 15,000 years ago). The glacial outwash events formed stream-deposits of sands and gravels, lake bottom deposits of clays, silts and fine sands, and poorly sorted mixtures of sands, silts, clays, gravels and boulders called glacial till. Granitic and metamorphic bedrock underlies the younger lacustrine deposits of sandy silts interbedded with alluvial sands and gravels. The granitic bedrock is associated with the Selkirk Mountains that extend towards the northwest.

2.4.3 Soil Stratigraphy

Soil borings on the site indicate the upper 10 to 12 feet to be composed of brownish, soft to medium stiff clayey silt with low plasticity and relatively low infiltration rates. This clayey silt is underlain by 4 to 6 feet of dark brown, loose silty sand containing fine to coarse sand and periodically interbedded with layers of light brown gravelly sand. The deeper intervals at 16 to 23 feet deep consist of dark brown to greenish brown, soft to medium stiff clayey silt.

2.4.4 Static Groundwater Conditions

The groundwater fluctuates beneath the Site based on changes in the river level as controlled by Albeni Falls Dam located within 5 miles downstream of the Site. Site groundwater monitoring wells indicate static groundwater levels range from 13 to 17 feet deep during the spring and summer months, and are lowered to levels ranging from 18 to 23 feet deep during the fall and winter months as the Pend Oreille River is lowered in response to the dam activities.

2.5 CHRONOLOGY OF EVENTS

2.5.1 Leaking UST Corrective Actions

In May 2003, a leaking UST was reported by Mr. Al Sudau of Albar to IDEQ. Mr. Sudau reported that approximately 1,200 gallons of unleaded gasoline was released from the leaking UST. Kleinfelder performed emergency response actions for the LUST in 2003, including the installation of an oil-seep interception trench at the edge of the river, removal of the leaking UST from the Site, excavation of petroleum contaminated soils (PCS) from the area between the

leaking UST to the edge of the river, disposal of 400 cubic yards (cy) of PCS at Waste Management's Graham Road Facility in Spokane, WA, and backfilling of the excavated area with pea gravel. Furthermore, approximately 42,000 gallons of petroleum-impacted groundwater was pumped from a groundwater sump constructed at the edge of the river, batch-treated on-site with aeration, and discharged into the City of Priest River sanitary sewer system. The excavation area of initial emergency response and soil removal activities (Kleinfelder, 2004a) is shown in Figure 4.

In August 2003, Kleinfelder installed an in-situ soil and groundwater remediation system on the site consisting of a soil vapor extraction system (SVE), groundwater air sparging system (AS) and total fluids air-stripper treatment system (TFTS). The soil vapor extraction system is comprised of a SVE vacuum unit connected to four (4) associated SVE well-points (AW-1, AW-2, AW-3, and AW-5). The air sparging system is comprised of an AS blower unit connected to six (6) associated AS well-points (AW-4, AW-6, AW-7, AW-8, AW-9, and AW-10). The total fluids treatment system is comprised of a ShallowTray© Low-Profile Air Stripper system with blower. Additionally, seven groundwater monitoring wells (MW-1 through MW-7), one angled groundwater monitoring well (AB-1), and four groundwater extraction wells (RW-1 through RW-4) were installed by Kleinfelder between August 2003 and March 2004 (Kleinfelder, 2005).

In September 2004, a Corrective Action Plan (CAP) was prepared for the site (Kleinfelder, 2004) based on the Idaho Risk-Based Corrective Action (RBCA) Guidance Documents. This CAP demonstrated that subsurface soils (at depths greater than 15 feet deep) and site groundwater petroleum concentrations exceed the risk-based screening levels for the volatilization to indoor air pathway and soil leaching to groundwater which discharges to surface water. Therefore, soil and groundwater cleanup levels were established for Site Specific Target Levels (SSTLs) calculated through RBCA. The 2004 CAP also outlined Kleinfelder's proposal "to continue to operate the treatment system and perform quarterly groundwater monitoring until the results of monitoring indicated IDEQ-approved clean-up levels have been met." This CAP was approved by IDEQ and implemented in July 2005.

Soil borings installed by Kleinfelder in December 2006 indicate that residual soil petroleum impacts remain on the site at depths greater than 15 feet deep.

The in-situ remediation system has been intermittently operated and periodically maintained on the site by Kleinfelder from 2004 through 2007. Kleinfelder has continued to monitor soil and groundwater remediation activities and collect groundwater samples on a quarterly basis from August 2003 through September 2007.

2.5.2 Voluntary Tank Removal Activities

In August 2007, two empty gasoline USTs at the Site were removed by JLZ with the assistance of Jeff Mathews of Kramer Excavation and under the supervision of Paul VanMiddlesworth of Golder Associates (Golder, 2007). Tank removal activities were performed in accordance with IDEQ Information Series #3, *Recommended Practices for Site Assessments During Closure of Underground Storage Tanks and Accidental Releases (Spills) of Petroleum Hydrocarbon Products*, and IDEQ Information Series #4, *Permanent Tank Closure*. All PCS encountered during tank removal activities that exhibited elevated volatile organic compounds (VOCs) measured with a field Photo-ionization Detector (PID) and COC concentrations exceeding Idaho Initial Default Target Levels (IDTL), used for screening level evaluation, were excavated and stockpiled on-site in a lined and bermed soil containment area to await removal and off-site disposal. Clean soils were stockpiled separately on-site to be used as backfill material. The

approximate excavation area and prior locations of former USTs and associated piping are presented in Figure 4.

The North Tank was located hydrologically upgradient of the former Leaking UST removed in 2003, with the fill-port located in the asphalt driveway. The South Tank was located hydrologically cross-gradient to the former Leaking UST removed in 2003, with the fill-port located in an unpaved area west of the former Dock N Shop building.

During tank removal activities, petroleum hydrocarbon impacts were encountered in shallow near surface soils at 0 to 3 feet deep , predominantly in the areas around the tank fill ports and the dispenser piping manifold area (Golder, 2007). These shallow contaminated soils were excavated and stockpiled in a bermed, and lined PCS soil containment area on site, and the associated dispenser piping was removed. Deeper soil petroleum impacts were encountered along the western margin of the South Tank from 3 to 10 feet deep during tank removal. This PCS was excavated and stockpiled on-site in the PCS containment area. No groundwater was encountered during tank removal activities.

Soil confirmation samples collected from the floor and walls of the North Tank cell as well as associated piping soil confirmation samples contained no detectable amounts of petroleum hydrocarbon components (Golder, 2007).

Wall confirmation samples collected from the South Tank cell showed no detectable amounts of petroleum hydrocarbon components. Furthermore, the floor confirmation sample from the southern end of the South Tank cell (ST-BS) showed no detectable petroleum hydrocarbons. However, the floor confirmation sample from the northern end of the South Tank (ST-BN), collected at 11 feet deep, contained BTEX and Naphthalene components exceeding Idaho IDTL cleanup values. Following additional excavation of the floor of the South Tank cell at the 11 to 13 foot depth interval in this area, Golder collected a deeper floor soil confirmation sample from the northern end of the South Tank (ST-BN-2) at 13 feet deep that showed no detectable amounts of petroleum hydrocarbon components (Golder, 2007).

2.5.3 Additional Subsurface Soil Investigation

Following the tank removal activities in August 2007, an investigation test pit was dug on the floor of the South Tank excavation cell. This test pit was located in the vicinity of recovery well RW-3, situated adjacent to the east of the leaking UST reported in 2003 and exposed the depth interval from 13 to 20 feet below the original ground surface (top of the river bank). Sample analytical results indicate that Ethylbenzene, Total Xylenes, and Naphthalene concentrations in the soil sample at 15 feet deep exceed Idaho IDTL cleanup levels. However, deeper soil samples from this test pit collected at the 17 foot and 20 foot depth intervals showed no detectable amounts of petroleum hydrocarbons components (Golder, 2007).

2.6 RELEASE SCENARIO AND SOURCE AREAS

A conceptual model for site contaminant pathways in Figure 7 presents the distribution of COCs with levels exceeding Idaho IDTLs, potential release mechanisms, and potential routes of exposure to be assessed through the Risk Evaluation Model.

2.6.1 Chemicals of Concern

Based on the history and past uses of the site as a fueling facility for vehicles and boats, gasoline constituents are considered as the known chemicals of concern (COCs) at this site. The event of

the leaking UST discovered and reported in May 2003 (Kleinfelder, 2003) and the fact that this UST was only used to store unleaded gasoline establish the site-specific COCs regulated by IDEQ as benzene, toluene, ethylbenzene, total xylenes (BTEX), ethylene dibromide (EDB), 1,2 dichloroethane (EDC), methyl tert-butyl ether (MTBE), and naphthalene.

2.6.1.1 Historical Impacts

An investigation in 1994 by Tracer Research Corporation identified the presence of elevated levels of petroleum components including Total Volatile Hydrocarbon Components (TVHC) in soil gas samples collected during a site assessment conducted on May 18, 1994 (displayed in Figure 3). Soil gas analytical results from this investigation indicated Benzene levels as high as 540 µg/L, Toluene levels as high as 100 µg/L, Ethylbenzene levels as high as 130 µg/L, Total Xylene levels as high as 540 µg/L, and Total Volatile Hydrocarbon Component (TVHC) levels as high as 150,000 µg/L. These petroleum components were found in site soil vapor samples collected from the 4 to 20 foot depth interval, with the highest concentration values occurring at the 12 to 20 foot depth interval.

2.6.1.2 Leaking UST Impacts

The LUST in May 2003 was reported to have released approximately 1,200 gallons of unleaded gasoline from the UST at the 10 to 11 foot depth interval (Kleinfelder, 2003). Site soil and groundwater impacts were determined to include BTEX, MTBE, and naphthalene concentrations exceeding Idaho IDTLs (Kleinfelder, 2005).

2.6.2 Contaminant Distribution

2.6.2.1 Chemicals in Soil

Soil sample analytical results (presented in Table 1) obtained through limited soil investigations performed between 2004 and 2007 (Kleinfelder, 2004; Kleinfelder, 2007a; and Golder, 2007) show that BTEX and naphthalene concentrations in site subsurface soils at the 15 to 20 foot depth interval exceed Idaho IDTLs. These subsurface soils are situated in the "smear zone" where the water table fluctuates between high and low groundwater conditions in response to river flow level changes.

2.6.2.2 Chemicals in Groundwater

Groundwater analytical results (presented in Table 2) have shown elevated levels of BTEX, MTBE, and naphthalene in site groundwater samples that exceed Idaho IDTLs (Kleinfelder, 2005). Site groundwater treatment performed by Kleinfelder includes:

- Air-stripping through pumping from recovery wells and treatment with the on-site Total Fluids Treatment System; and
- In-situ aeration through air sparging wells.

Based on the most recent groundwater sampling activities performed by Kleinfelder in September 2007, Benzene concentrations exceed IDTLs in MW-1 and RW-4.

2.6.2.3 Chemicals in Surface Water

COCs could potentially enter surface waters of the Pend Oreille River through the interaction with site groundwater. This pathway will be addressed through the REM process in this work plan to determine acceptable groundwater concentrations to be protective of surface waters of the Pend Oreille River.

2.6.2.4 Chemicals in Soil Vapor

Soil vapor analyses performed in 1994 (Tracer Research, 1994) detected BTEX and TVHC constituents in site soil vapor samples collected from the 4 to 20 foot depth interval. Potential human health hazards from COCs in site subsurface soil vapors will be addressed through the REM process in this work plan based on indoor inhalation of vapor emissions from site subsurface soils.

3.0 EXPOSURE ASSESSMENT AND RISK EVALUATION

3.1 INTRODUCTION

IDEQ's Risk Evaluation Model (REM) has been employed to estimate the degree of risk to the identified receptors from complete or partially complete contaminant pathways on the site. Exposure of receptors to contaminants in site subsurface soils and groundwater has been assessed through initial screening evaluation by comparison of site soil and groundwater concentrations with Idaho IDTL values. Following this initial screening level evaluation, Golder performed a RE-1 Risk Evaluation for the site and calculated cumulative risk and hazard index values in order to determine if health risks exist at the site that may impose adverse impacts to human receptors or potentially degrade the quality of surface waters of the Pend Oreille River as a result of the LUST reported in 2003. RATL-1 cleanup levels have been calculated for the receptor-exposure pathways producing cumulative hazard quotient values that exceed target risk criteria.

A Site Conceptual Model has been developed to present the potential contaminant exposure routes from COCs present in site subsurface soil and groundwater.

3.2 SCREENING LEVEL EVALUATION

Recent soil analytical results (Kleinfelder, 2007a; Golder, 2007) show current petroleum impacts of Benzene, Toluene, Ethylbenzene, Total Xylenes, and Naphthalene constituents exceeding IDTLs (presented in Table 1) in site subsurface soils at the 15 to 20 foot depth interval.

3.3 SITE CONCEPTUAL MODEL FOR CURRENT CONDITIONS

A Site Conceptual Model (Figure 7) has been developed for the site to identify areas of potential exposure to COCs that could adversely impact human health and environmental receptors. The Site Conceptual Model is based on potential contaminant migration routes from indoor inhalation of vapor emissions from subsurface soil and groundwater to residential, non-residential, and construction worker receptors as well as potential impacts to surface waters of the Pend Oreille River.

3.4 INPUT PARAMETERS FOR RISK EVALUATION-1

In order to develop site risk estimates to identified receptors, IDEQ uses the following inputs for the REM model:

- Representative soil and groundwater COC concentrations;
- Site-specific fate and transport parameters;
- Chemical-specific toxicological factors developed by EPA and others;
- Receptor-specific exposure factors including body weight, exposure duration and frequency, inhalation rates, dermal absorption factors, etc; and,
- Physical and chemical properties of the COCs and hydrogeochemical characteristics of site soil and groundwater conditions.

3.4.1 Identified Receptors

Due to the anticipated future use of the site as mixed-use, multi-tenant residential housing, the potential receptors identified in the REM assessment include:

- Residential Receptors
- Non-Residential workers
- Construction workers
- Surface Water Receptors

Health risk index values have been calculated for each of these receptors using the REM model.

3.4.2 Contaminant Migration Pathways and Routes of Exposure

The site contaminant pathway from subsurface soils is considered indoor inhalation of vapor emissions due to the fact that the reported LUST in 2003 occurred at the 10 to 11 foot depth interval, releasing petroleum hydrocarbon constituents to the site subsurface.

The potential transport of subsurface soil contaminants through groundwater migration from the site to surface waters of the Pend Oreille River is also considered a potential pathway of exposure based on the interaction of groundwater with the subsurface soils and nearby exposure of groundwater to the Pend Oreille River surface water. Potential risks to surface water sources have been determined for the mixing of site groundwater at the point of contact with surface waters of the Pend Oreille River.

Surface soil is not considered as a transport media in the REM calculations since accidental surface spills occurring on the asphalt surfaces were directed towards stormwater drains, and shallow (0 to 3 feet deep) petroleum-impacted soils in the vicinity of the USTs were previously excavated and removed from the site during Initial Response Actions in 2003 (Kleinfelder, 2003) and Tank Removal activities in 2007 (Golder, 2007). Therefore, potential direct exposure to surface soils is assumed to be eliminated from the site through previous excavation activities.

3.4.3 Fate and Transport Parameters

Subsurface soils located at the 15 to 20 foot depth are the primary focus of the fate and transport risk evaluation process due to the fact that residual petroleum impacts to these soils are associated with the water table fluctuations in the “smear zone” and have not been completely removed from the site. Therefore, the depth from ground surface to the contaminant source area used in the REM calculations has been established at the 15 to 20 foot depth interval.

The interaction of groundwater with the petroleum contaminated sediments in the smear zone fluctuates in response to adjusted river flow levels and can potentially allow contaminants to migrate to the surface waters of the Pend Oreille River. Therefore, removal of the PCS from the smear zone will eliminate the subsurface soil indoor inhalation of vapor emission pathway as well as mitigate the potential migration pathway of COCs to surface waters of the Pend Oreille River.

Two stratigraphic units were identified in the field (i.e., upper medium-grained silty-sands and lower fine-grained silts) and included in the REM model to account for the site hydrogeologic variations of near-surface silty-sands (characterized by a moderate hydraulic conductivity) compared with the deeper silts (characterized by lower hydraulic conductivity values).

Default values were used for all other fate and transport parameters required for the REM model, including air parameters, enclosed space parameters, particulate emissions, and soil physical properties.

3.4.4 Representative Site Subsurface Soil Concentrations

Existing soil analytical data for the Site is limited to the areas of focused investigations on the site performed by Kleinfelder (Kleinfelder, 2003; and Kleinfelder, 2006), and Golder Associates (Golder, 2007). Limited soil analysis was performed during the initial soil removal activities in 2003 and during installation of monitoring wells and the in-situ remediation system in 2004. Soil analytical results obtained by Golder during tank removal activities in August 2007 substantiate soil COC concentrations reported by Kleinfelder in 2003 and 2006, and show Benzene, Toluene, Ethylbenzene, Total Xylenes, and Naphthalene levels exceeding Idaho IDTL values for soil samples at the 15 to 17 foot depth interval. A summary of the limited soil analytical detections for the site is presented in Table 1. Kleinfelder soil boring sample locations are shown in Figure 5. Golder soil sample locations are shown in Figure 6.

As a conservative means of evaluating the potential risk to site receptors via the soil vapor intrusion pathway to indoor air, the maximum concentrations of COCs found in any single soil sample for all chemicals with detections were selected for the representative soil COC concentrations to be used in the REM calculations. The maximum concentrations of COCs were detected in sample ST-BN collected at 11 feet deep beneath the northern end of the South Tank by Golder during tank removal activities (Golder, 2007). These representative soil COC values (presented in Table 1) are assumed to represent conservative values for maximum concentrations of each COC anticipated to be encountered during the soil excavation activities presented in this work plan.

Constituents with analytical detections below the laboratory method detection limit used half the value of the laboratory PQL as the representative concentration. Representative site soil concentrations used in the REM process are presented in Table 1. A summary of site COC soil analytical detections and statistical averages is presented in Appendix C

Table 1 – Representative Subsurface Soil COC Concentrations used in REM Calculations

Constituents of Concern		**Benzene**	**Toluene**	**Ethylbenzene**	**Total Xylenes**	**EDB**	**EDC**	**MTBE**	**Naphthalene**
Sample ID	**Sample Depth (ft bgs)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
ST-BN*	11'	**15**	**150**	**49**	**239**	0.0006	0.0006	0.0006	**18**
IDEQ IDTLs		0.0178	4.89	10.2	1.67	0.00014	0.0077	0.0364	1.14

*Soil Sample ST-BN collected by Golder Associates on 08/06/07 (Golder, 2007).
Bold Values exceed Idaho IDTLs

3.4.5 Representative Site Groundwater Concentrations

Groundwater was evaluated through the REM process to assess the risk to surface waters of the Pend Oreille River and potential migration of COCs from site groundwater to indoor air. Allowable groundwater concentrations will be determined at the Source and Point of Compliance to be protective of surface waters. Representative site groundwater COC concentrations are based on a 4-quarter average of groundwater analytical detections from the last four groundwater monitoring events performed at the site between June 2006 and September 2007 (Kleinfelder, 2006b; Kleinfelder, 2006c; Kleinfelder, 2007b; Kleinfelder, 2007c) and are presented in Table 2. Constituents with analytical detections below the laboratory analytical detection limit used half the value of the laboratory PQL for an actual concentration value.

Table 2 – Representative Groundwater Concentrations used in REM Calculations

Constituents of Concern		**Benzene**	**Toluene**	**Ethylbenzene**	**Total Xylenes**	**EDB**	**EDC**	**MTBE**	**Naphthalene**
Sample Collection Event	**Sample ID**	**(mg/L)**	**(mg/L)**	**(mg/L)**	**(mg/L)**	**(mg/L)**	**(mg/L)**	**(mg/L)**	**(mg/L)**
Kleinfelder, 06/20/06	MW-1	**0.086**	0.14	0.0944	0.76	NA	NA	0.0025	0.0025
Kleinfelder, 06/20/06	RW-1	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
Kleinfelder, 06/20/06	RW-2	**0.0248**	0.0005	0.00839	0.00185	NA	NA	0.0025	0.0021
Kleinfelder, 06/20/06	RW-4	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
Kleinfelder, 09/22/06	MW-1	**0.14**	0.252	**0.234**	0.972	NA	NA	**0.061**	**0.225**
Kleinfelder, 09/22/06	RW-1	**0.049**	0.049	0.043	0.17	NA	NA	**0.059**	0.037
Kleinfelder, 09/22/06	RW-2	**0.0195**	0.0118	0.0127	0.0678	NA	NA	0.011	0.0408
Kleinfelder, 09/22/06	RW-4	**0.041**	0.093	0.047	0.235	NA	NA	0.012	0.0435
Kleinfelder, 09/27/07	MW-1	**0.023**	0.016	0.052	0.113	NA	NA	0.0025	0.045
Kleinfelder, 06/14/07	RW-1	**0.278**	0.0476	0.0471	0.2576	NA	NA	0.0025	0.0355
Kleinfelder, 06/14/07	RW-2	0.00426	0.0005	0.00348	0.0005	NA	NA	0.0025	0.00681
Kleinfelder, 06/14/07	RW-4	**0.0632**	0.0902	0.0326	0.2757	NA	NA	0.0025	0.0246
Kleinfelder, 06/14/07	MW-1	**0.0808**	0.054	0.0613	0.2931	NA	NA	0.0025	0.0243
Kleinfelder, 09/27/07	RW-1	0.00098	0.002	0.037	0.123	NA	NA	0.0025	0.029
Kleinfelder, 09/27/07	RW-2	0.00128	0.0005	0.0005	0.0005	NA	NA	0.0025	0.00118
Kleinfelder, 09/27/07	RW-4	**0.051**	0.027	0.054	0.099	NA	NA	0.0025	0.0195
4 Quarter AVERAGE		**0.062**	**0.056**	**0.052**	**0.241**	**NA**	**NA**	**0.012**	**0.038**
IDEQ IDTLs		0.005	1.0	0.7	4.34	0.00005	0.005	0.017	0.21

Bold Values exceed Idaho IDTLs

3.5 COMPARISON OF CALCULATED RISK WITH TARGET RISK CRITERIA

Target Risk criteria are based on the soil vapor intrusion pathway to indoor air and protection of surface water organisms, where calculated Site Risk values must not exceed $1x10^{-5}$ and Target Site Hazard Index value must not exceed 1.0.

The results of the RE-1 Risk Evaluation for the site are presented in Appendix D. A summary of the RE-1 Risk Evaluation results presented in Table 3 shows that site RE-1 risk and cumulative hazard values calculated for residential (1.49×10^{-4}) and non-residential (1.68×10^{-5}) receptors exceed the target risk range of 1×10^{-5} for indoor inhalation of vapor emissions from subsurface soils. Therefore, the estimated risk to Residential and Non-residential receptors from the soil vapor intrusion pathway to indoor air based on the assumed concentrations in site soil and groundwater are determined to be unacceptable health risks to humans.

Remedial Action Target Levels (RATL-1) must be calculated to determine soil cleanup levels for the site based on the soil vapor intrusion pathway to indoor air. Furthermore, allowable groundwater concentrations protective of surface water organisms must be calculated for the interaction of site groundwater with surface waters of the Pend Oreille River.

The RE-1 risk values for the Construction Worker (3.00×10^{-8}) receptor is less than the target risk range of $1x10^{-5}$ and is therefore considered an acceptable risk to humans. Site Risk and Hazard Index values calculated using the REM model are presented in Table 3 below.

Table 3 – Site RE-1 Risk and Hazard Values Calculated Through REM

RE-1 Risk / Cumulative Hazard Quotients						
Receptor	**Residential**		**Non-Residential**		**Construction Worker**	
Pathway	**Subsurface Soil**		**Subsurface Soil**		**Surface Soil**	
COC	**Site Risk**	**Hazard Index**	**Site Risk**	**Hazard Index**	**Site Risk**	**Hazard Index**
Benzene	1.48E-04	2.23E+00	1.67E-05	1.15E+00	1.30E-09	5.89E-04
Toluene	*NTOX*	6.70E-02	*NTOX*	3.45E-02	*NTOX*	7.81E-05
Ethylbenzene	*NTOX*	2.16E-01	*NTOX*	6.04E-02	*NTOX*	7.23E-04
Total Xylenes	*NTOX*	1.05E+01	*NTOX*	2.63E+00	*NTOX*	5.30E-02
EDB	2.53E-07	8.97E-02	7.47E-09	3.01E-02	9.54E-09	3.01E-03
EDC	2.99E-08	3.65E-04	1.65E-09	1.88E-04	1.91E-08	1.88E-02
MTBE	1.15E-10	8.91E-04	3.74E-12	1.32E-04	4.35E-11	8.10E-06
Naphthalene	*NTOX*	3.26E+00	*NTOX*	2.60E-01	*NTOX*	1.95E-02
Site Risk	1.49E-04		1.68E-05		3.00E-08	
Cumulative Site Hazard Index		16.3		4.14		0.087

NTOX – The toxicity parameter(s) required in the calculation of the value is not available.

3.6 CALCULATION OF RATL-1 CLEANUP LEVELS

Based on the REM calculations presented in Appendix D, calculated risk and hazard index values for residential and non-residential receptors through indoor inhalation of vapor emissions pathway exceed the target risk criteria. Therefore, RATL-1 cleanup levels have been calculated for site soils based on the soil vapor intrusion pathway to indoor air and protection of surface water. RATL-1 values calculated with the REM model are presented in Table 4.

Table 4 – Site Soil RATL-1 Values Calculated Through the Idaho REM Process

Constituent of Concern	Representative Concentration	Residential	Non-Residential	Construction Worker	Soil Concentration Protective of Surface Waters	Minimum Calculated Value
		Subsurface Soil	Subsurface Soil	Surface Soil		
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Benzene	15.0	0.254	0.654	15.5	0.0043	**0.0043**
Toluene	150.0	187	218	6,770	33.2	**33.2**
Ethylbenzene	49.0	18.9	40.5	1,290	45.3	**18.9**
Total Xylenes	239	1.89	4.54	147	*NSWSTD*	**1.89**
EDB	0.0001	0.008	0.018	0.388	*NSWSTD*	**0.008**
EDC	0.0001	0.084	0.296	4.41	0.00083	**0.00083**
MTBE	0.0001	13	200	5,630	*NSWSTD*	**13**
Naphthalene	18.0	0.46	3.47	24	*NSWSTD*	**0.46**

NSWSTD – No Surface Water Standard is available or calculated for the chemical

The risks and hazard values calculated for site receptors from the groundwater vapor intrusion pathway to indoor air based on representative site groundwater concentrations are acceptable for all on-site receptors. However, acceptable groundwater concentrations must be determined for the site to be protective of surface waters of the Pend Oreille River. Therefore, groundwater RATL-1 cleanup levels and acceptable site groundwater concentrations for surface water protection have been calculated and are presented below in Table 5.

Table 5 – Groundwater RATL-1 Values and Concentrations Protective of Surface Waters

Constituent of Concern	Representative Concentration	Residential	Non-Residential	Groundwater Concentration Protective of Surface Water	Minimum Calculated Value
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Benzene	0.062	0.222	3.25	0.0012	**0.0012**
Toluene	0.056	139	920	6.8	**6.8**
Ethylbenzene	0.052	13.2	85.5	3.1	**3.1**
Total Xylenes	0.241	1.46	9.45	*NSWSTD*	**1.46**
EDB	0.0001	NA	0.018	*NSWSTD*	**0.018**
EDC	0.0001	NA	0.296	0.00038	**0.00038**
MTBE	0.012	65.6	1,850	*NSWSTD*	**65.6**
Naphthalene	0.038	0.556	3.70	*NSWSTD*	**0.556**

NSWSTD – No Surface Water Standard is available or calculated for the chemical.

4.0 RECOMMENDATIONS FOR SITE EXPOSURE

4.1 REMEDIAL ACTION PLAN

Based on the extent and magnitude of Petroleum Contaminated Soil (PCS) remaining in the subsurface of the site, the recommended remedial action presented in this Work Plan is the excavation and off-site disposal of subsurface soils in the "smear zone" at the 15 to 20 foot depth interval as well as soils encountered during excavation activities with petroleum hydrocarbon contamination resulting from the 2003 reported LUST. All PCS excavated from the site will be disposed off-site at Waste Management's Graham Road Landfill, a certified PCS disposal facility. The approximate extent of proposed soil excavation activities presented in this work plan is presented in Figure 8.

Groundwater remedial activities will include the removal of any free petroleum product encountered during soil removal activities. Following soil excavation and removal activities, groundwater COCs will be monitored through a network of groundwater monitoring wells for at least four consecutive quarters or as long as necessary to demonstrate to IDEQ that site groundwater cleanup criteria have been achieved.

4.2 RECOMMENDED REMEDIAL MEASURES

Soil and groundwater contaminant exposure pathways evaluated through the REM process may be effectively eliminated by excavating the remaining PCS from the smear zone on the Site and disposing of all contaminated soils at a certified off-site disposal facility. Soil removal will meet the minimum RATL-1 cleanup levels selected from the REM calculations for site soil and groundwater cleanup levels (presented in Table 6) to be protective of human health and surface water receptors.

Table 6 – Minimum RATL-1 Values Selected for Site Soil and Groundwater Cleanup Levels and Anticipated Laboratory Practical Quantitation Limits

Constituent of Concern	Laboratory Analytical Method	SOIL		GROUNDWATER	
		RATL-1 Target Levels	Laboratory PQL Values	RATL-1 Target Levels	Laboratory PQL Values
		(mg/kg)	(mg/kg)	(mg/L)	(mg/L)
Benzene	EPA 8260B/5035A	0.0043	0.001	0.0012	0.001
Toluene	EPA 8260B/5035A	33.2	0.001	6.8	0.001
Ethylbenzene	EPA 8260B/5035A	18.9	0.001	3.1	0.001
Total Xylenes	EPA 8260B/5035A	1.89	0.001	1.46	0.001
EDB	EPA 8260B/5035A	0.008	0.001	0.018	0.001
EDC	EPA 8260B/5035A	0.00083	0.001	0.00038	0.001
MTBE	EPA 8260B/5035A	13	0.001	65.6	0.001
Naphthalene	EPA 8260B/5035A	0.460	0.005	0.556	0.005

The excavation activities presented in this work plan will use the minimum RATL-1 values as target cleanup levels to direct the proposed excavation and removal of PCS in the smear zone at the 15 to 20 foot depth interval. A timeline of events and implementation schedule for the activities in this work plan are presented in Table 7 in Section 4.2.1.10.

Groundwater has been evaluated as a potential risk to surface waters based on the interaction of site groundwater with surface waters of the Pend Oreille River. Therefore, groundwater will be monitored for four consecutive quarters or as long as necessary in order to effectively demonstrate to IDEQ that site groundwater concentrations considered to be protective of surface waters have been achieved.

4.2.1 Excavation and Disposal of Petroleum Contaminated Soils

Soils on the Site containing petroleum components exceeding the RATL-1 cleanup levels shall be excavated and temporarily stockpiled on 12-Mil plastic sheeting with earthen berms in an on-site PCS soil containment area prior to removal from the site. Golder personnel will monitor the excavated soils to identify petroleum impacts using a field photo-ionization detector (PID), olfactory testing, and visual observations. Stockpiled PCS will be sampled for laboratory analysis in order to characterize the soils for disposal purposes, and transported to Waste Management's Graham Road Landfill in Medical Lake, Washington for final disposal.

4.2.1.1 PCS Excavation and Removal

The intent of this work plan is to excavate and remove site soils in the "smear zone" at the 15 to 20 foot depth interval as well as soils located in and around the in-situ remediation system with petroleum hydrocarbon concentrations exceeding calculated RATL-1 cleanup levels. If shallower soil petroleum impacts are encountered in the 0 to 15 foot depth interval during excavation activities, soils identified with petroleum impacts based on field PID readings and/or laboratory analysis will be added to the PCS soil stockpile for off-site disposal. This excavation activity is intended to effectively and completely remove the soils remaining on the site petroleum hydrocarbon contamination as a result of the 2003 reported LUST. Subsurface soils will be excavated to calculated RATL-1 cleanup levels. The proposed excavation area and anticipated limits site disturbance activities are presented in Figure 8.

Soil excavation activities will be performed in accordance with the following procedures:

1. The cleanup criteria involves the removal of site soils to meet REM-calculated RATL-1 cleanup levels for the indoor inhalation of vapor emissions from subsurface soil pathway to be protective of human health and the environment as presented in Idaho Risk Evaluation Manual (July 2004).

2. Army Corps of Engineers/Idaho Department of Lands Joint Permit shall be obtained prior to excavating below the Ordinary High-water Mark (OHM).

3. Means of egress for both personnel and equipment would be provided in accordance with Idaho's Best Management Practices (BMPs). Excavation side slopes will not exceed 1.5H:1V (1.5 feet horizontal to 1 foot vertical) or properly shored for stability.

4. Temporary fencing will be placed around the perimeter of the excavation area in accordance with Idaho's BMPs. Prior to initiation of construction activities, some of the existing Site fence may be taken down to facilitate remediation activities.

5. Conventional construction equipment such as backhoes, excavators, and trucks would be used for impacted soil excavation. Excavation equipment would not require decontamination until completion of the project, as long as the equipment remains within the fenced project area. Equipment will be properly decontaminated prior to removal from the fenced project area.
6. Excavation will be performed according the standard industry practices in compliance with Idaho's BMPs. Water spray would be used if necessary for dust suppression during excavation and loading activities. Low volume water sprays will be applied to material surfaces using equipment appropriate for the task. Water trucks will be used for suppression of roadway dust if necessary.
7. Soils will be excavated to the lowest water table level at the low flow level of the Pend Oreille River during low groundwater conditions for the year (November – April). Water table elevations will be determined using an existing groundwater monitoring well located on site as a "control well".
8. The average depth of the excavation is anticipated to be 15 to 20 feet below ground surface, located in the "smear zone" where groundwater temporally fluctuates in response to changing river levels. Shallower PCS encountered during excavation activities will be removed and added to the PCS soil stockpile for off-site disposal.
9. Golder will utilize a field PID instrument during remedial excavation as a field method to indicate the limits of the petroleum-impacted soils. Soil excavation activities will continue until the field PID and the laboratory confirmation samples indicate achievement of the calculated RATL-1 soil cleanup levels.
10. Excavated soils may be placed directly into the transport vehicles, or loading may occur from temporary PCS stockpiles next to the excavation.
11. Laboratory analyses for BTEX, MTBE, EDB, EDC and naphthalene constituents in soil confirmation samples will comply with EPA Method 8260B/5035A, as required by IDEQ.
12. Clean soils will be stockpiled separately to be used for backfill material following soil excavation activities.
13. Contaminated soils will be identified through field PID and laboratory analytical results. PCS will be stockpiled in a soil containment area on 12-Mil plastic sheeting with earthen berms sufficient to prevent off-site migration of the stockpiled soils. Stockpiles will be covered overnight to minimize wind-blown dust or exposure to precipitation.
14. All PCS excavated from the site will be transported and disposed at a certified PCS disposal facility.
15. Conventional highway-approved transport vehicles will be used, including standard dump trucks, pony trailers, and roll-off containers. All petroleum-impacted soil loads would be covered during transport to the disposal facility.
16. Golder's Health and Safety Plans will be in place during excavation activities. Technical Standard Operating Procedures and QA/QC quality control procedures will be utilized for field activity oversight and laboratory analytical review.
17. The excavation would remain open and secured until confirmation sampling results have been received and evaluated and approval has been obtained from

IDEQ stating that the selected cleanup criteria have been achieved. The excavated area would then be backfilled with clean fill and the area returned to its original grade. Backfill would be placed in lifts and compacted to sufficient compaction levels within a defined moisture content range.

18. A site map showing soil confirmation sample locations and limits of the final PCS excavation activities will be produced.
19. If encountered, all excess water will be drained from soil in the excavator bucket prior to loading into the trucks and transporting soil from the excavation area. Impacted drainage from the excavator bucket will be captured and treated on-site using an activated carbon filter. Treated waters will be sampled and tested for BTEX, MTBE, EDB, EDC, and naphthalene constituents. After laboratory analytical results have been received indicating COC levels are below acceptable groundwater concentrations, the treated waters will be discharged on-site.
20. Groundwater laboratory analyses will comply with EPA Method 8260B for BTEX, MTBE, EDC and naphthalene constituents, and EPA Method 8011 for EDB, as required by IDEQ.

4.2.1.2 PCS Stockpile Characterization

Stockpiled PCS will be sampled prior to removal from the site as per the requirements established in IDEQ's Petroleum Pollution Prevention and Remediation Information Series #3 (IDEQ, 2002a). Grab samples will be taken from a location at least 1 foot into the stockpile in areas considered to be the most highly contaminated portions of the stockpile. Soil stockpile samples will be analyzed for BTEX, MTBE, EDB, EDC and naphthalene constituents using laboratory analytical methods that comply with EPA Method 8260B and EPA Method 5035A, as required by the PCS disposal facility.

4.2.1.3 PCS Transport and Disposal

A Generator's Non-Hazardous Waste Profile Form will be completed and submitted to the regional Waste Management office in Portland requesting transport and disposal of the PCS from the Site to Graham Road Landfill in Medical Lake, Washington or other approved facility that accepts PCS. JLZ Enterprises will be listed as the Generator of the PCS.

After submittal of waste designation reporting to the permitted disposal facility, and receipt of its approval for shipment of the subject waste soils, the excavated soils shall be placed directly into the transport vehicles, or loading may occur from temporary stockpiles next to the excavation. On-site stockpiles shall have berms constructed of soil and lined with a minimum of 12-Mil plastic sheeting. Stockpiles shall be covered overnight to minimize wind-blown dust.

Transport vehicles and transportation shall be provided by the contractor. Conventional highway approved equipment shall be used, and could include standard dumps, pony trailers and roll-off containers. All contaminated soil loads shall be covered during transport to the disposal facility.

The Waste Management's Graham Road Landfill has agreed to accept and provide disposal at their landfills for contaminated soils generated during this proposed remediation project. Waste Management's intent is to recycle the soils as landfill cover. The landfill is located approximately 60 miles from the Site. The likely transportation route out of town will be via Washington State Highway 2 to minimize traffic issues. The transportation of excavated soil off-site and the return of semi-trailers would impact traffic only in the immediate vicinity of the Site.

The excavation shall remain open and secured until confirmation sampling results have been received and evaluated. Further grading for site development may continue once confirmation sampling has established that cleanup levels have been attained.

4.2.1.4 Groundwater Treatment

If free petroleum product is identified floating on the groundwater, the product will be removed with oil-absorbent pads. Groundwater may need to be pumped into Baker Tanks for temporary storage of impacted groundwater during excavation activities to allow for equipment access to complete the removal of petroleum impacted soils from the smear zone. Any petroleum impacted groundwater temporarily stored on-site will be treated by filtration through an activated carbon cartridge and disposed on-site. Treated waters will be sampled and tested for BTEX, MTBE, EDB, EDC, and naphthalene constituents. After laboratory analytical results have been received indicating COC levels are below acceptable groundwater concentrations, the treated waters will be discharged on-site.

4.2.1.5 Soil Confirmation Sampling

Following PCS excavation activities, Golder will collect confirmation soil samples from the excavation sidewalls and floor to demonstrate to IDEQ that calculated RATL-1 soil cleanup levels have been attained using certified laboratory analytical methods incorporating multi-incremental sampling techniques. Laboratory confirmation testing of post-excavation soil samples will occur on an approximate 25-ft square grid. QA/QC samples will be collected, including duplicate samples, field blanks, and MS/MSD samples.

Soil confirmation samples will be analyzed for BTEX, MTBE, EDB, EDC and naphthalene constituents using laboratory analytical methods that comply with EPA Method 8260B and EPA Method 5035A, as required by IDEQ in order to attain laboratory practical quantitation limits (PQL) sufficient to provide proper representation of the calculated RATL-1 cleanup levels listed in Table 6.

Soil confirmation samples will be collected from each wall of the excavation area at 25-foot spaced intervals. Floor confirmation soil samples from the excavation will be collected in a grid fashion with anodes located 25-feet apart.

4.2.1.6 Technical Procedures for Soil Sampling

The soil sampling program shall be subject to controls and strict QA protocols and procedures specified in the relevant technical documents including the following:

- TP 1.2-5 “Drilling, Sampling, and Logging Soils”;
- TP 1.2-6 “Field Identification of Soil”;
- TP 1.2-18 “Sampling Surface Soil for Chemical Analysis”; and
- TP 1.2-23 “Chain of Custody”.

4.2.1.7 Soil Sampling Methods

Confirmation samples shall be collected using a soil punch or syringe from the post-excavation surface soil at a discrete location at the approximate center of each sampling grid square and placed in the proper pre-preserved and pre-weighed sampling container.

The sampling method shall be governed by safe work practices and State and Federal OSHA regulations for trenching activities. No sampling will be conducted from within excavations deeper than 4 feet below ground surface (bgs), unless the sidewalls are properly shored or laid back and approved by a geotechnical engineer.

After collection, an aliquot of soil shall be immediately placed into an appropriate sample container for chemical analysis. The location relative to established reference points and the depth interval for each sample shall be recorded.

Samples will be collected in containers of appropriate volume and type appropriate to the analytical method. After filling, the containers will be immediately sealed, labeled and placed in a cooler maintained at 4°C. Samples will be transported to the laboratory for analysis with chain of custody documentation in sufficient time to perform the requested analyses within the applicable holding times.

Documentation for sampling will include container labels, completion of Sample Integrity Data Sheets and Chain of Custody Records. Sample coolers will be secured with chain of custody seals. The Sample Integrity Data Sheet will be used to document sample collection information.

4.2.1.8 Decontamination Methods

All sampling equipment will be decontaminated before the start of sampling activities and between each use. The sampling equipment will be washed with a non-phosphate detergent (Alconox or equivalent) solution using brushes to remove all visible dirt and grit. An organic free distilled/deionized water rinse will be used to thoroughly remove all detergent solution. The final rinse will be organic free distilled/deionized water. Should oil or other visible organic matter remain on the sampling equipment after the detergent/water wash, a methanol-soaked towel will be used to remove material and the full-complement of decontamination procedures repeated. If the material cannot be removed, the equipment will be retired and not used again. All decontamination rinsates produced during sampling will be collected in suitable containers for temporary on-site storage. The results of the soil sampling and analysis will be used to determine appropriate means of decontamination rinsate disposal. The decontamination rinsates will be disposed of in accordance with all applicable regulatory requirements.

4.2.1.9 Backfilling of Excavation Area

The excavation area will be backfilled using native clean soils stockpiled separately from the PCS on site during excavation activities. Additional clean backfill material will be acquired from local sources as needed to return the bank to the original existing slope and pre-existing ground level.

4.2.1.10 Work Plan Schedule

The activities in this work plan are anticipated to occur on the proposed dates presented below in the proposed implementation timeline:

Table 7 – Proposed Timeline for Implementation of Voluntary Remediation Work Plan Activities

PROPOSED DATE	EVENT
	Submittal of Final Voluntary Remediation Work Plan to IDEQ.
Week 1	Initiation of 30-day comment period for Public Review Process.
Week 2 – 6	Public Review Period for VCP Work Plan.
Week 7 – 8	Soil excavation; on-site sorting; temporary stockpiling of PCS.
Week 9 – 10	Transport and disposal of PCS at Waste Management's Graham Road Landfill.
Week 11 – 14	Prepare Draft Completion Report of VCP Soil Excavation Activities and Soil Confirmation Analytical Results.
Week 15	Submittal of Draft Completion Report for VCP Soil Excavation Activities including analytical results to IDEQ.
Week 16 - 18	IDEQ Review of Draft Completion Report.
Week 19 – 20	Incorporate IDEQ comments and prepare Final Completion Report of VCP Soil Excavation Activities and Analytical Results.
Week 20	Submittal of Final Report of VCP Soil Excavation and Analytical Results to IDEQ.
TBD	Site Groundwater First Quarter Progress Report
TBD	Site Groundwater Second Quarter Progress Report
TBD	Site Groundwater Third Quarter Progress Report
TBD	Site Groundwater Fourth Quarter Progress Report

TBD – Schedule To Be Determined based on completion of soil excavation activities and submittal of Final Completion Report.

4.2.2 Post-Excavation Groundwater Monitoring

In order to ensure groundwater petroleum impacts do not degrade surface waters of the Pend Oreille River, groundwater will be monitored for four consecutive quarters or as long as necessary in order to address groundwater contaminants as they may affect surface water concentrations and effectively demonstrate to IDEQ that site groundwater cleanup criteria have been achieved.

Following PCS excavation activities, a proposal for post-excavation groundwater monitoring well network installation and groundwater Sampling and Analysis Plan (SAP) will be submitted to IDEQ for approval prior to installation. Following approval by IDEQ, a sufficient number of groundwater monitoring wells will be installed downgradient from the final soil excavation area in order to confirm site groundwater COC concentrations are below acceptable concentrations to be protective of surface waters of the Pend Oreille River. Monitor wells will be constructed with the screened interval straddling the zone of seasonal water table fluctuation for proper monitoring of the aquifer and detection of any free-phase petroleum product.

Groundwater samples will be analyzed for BTEX, MTBE, EDB, EDC, and naphthalene petroleum components using EPA Method 8260B/8011 as required by IDEQ.

4.2.3 Institutional Controls

DEQ allows the use of an institutional control to reduce the potential for receptors to be exposed to site-specific COCs. Based on the fact that the City of Priest River provides municipal water to the site and future use of the site is anticipated to utilize City services, IDEQ recognizes that the potentially affected populations on and off-site are highly unlikely to use the impacted shallow groundwater at the Site for drinking water and therefore the practical risks of exposure of human receptors to site groundwater contaminants are low.

However, because the potential does exist for a well to be installed at the site (however small the probability), IDEQ requires some form of remedy to insure that this pathway remains incomplete, eliminating the potential risks to human receptors from drinking the shallow groundwater. Therefore, use of an environmental covenant prohibiting the use of site groundwater for drinking water purposes on the effected property is an institutional control that would be considered an acceptable remedial approach by IDEQ.

If required, an environmental covenant for the Site will be prepared and submitted to IDEQ for approval before it is recorded on the individual deeds. Once approved, the environmental covenants will be recorded at the Bonner County Recorder's Office in Sandpoint, Idaho. Proof of the recordings will be provided to IDEQ.

4.2.4 Filing for Certificate of Completion

Following the completion of soil excavation, PCS disposal, and groundwater monitoring activities, a post-excavation RE-1 Risk Evaluation will be performed for the site using soil and groundwater confirmation sample analytical data to estimate the degree of risk to identified receptors from complete or partially complete contaminant pathways on the site. Cumulative risk and hazard index values will be calculated in order to determine if health risks exist at the site that may impose adverse impacts to human receptors or potentially degrade the quality of surface waters of the Pend Oreille River.

If post-excavation site risk values and cumulative hazard quotients are determined to be below target risk criteria, a Voluntary Remediation Work Plan Completion Report together with a request for a "*Certificate of Completion*" for the successful implementation of soil and groundwater voluntary remediation activities will be submitted to IDEQ. The completion report shall be supported by documentation indicating the extent of soil excavation activities, the removal of subsurface PCS, disposal of PCS at the proper off-site disposal facility, and QA/QC validation of soil and groundwater laboratory analytical results as required by IDEQ.

If any risk values or cumulative hazard quotients are determined to exceed target risk criteria following the implementation of this work plan, a contingency plan for additional soil excavation and removal activities and/or groundwater treatment activities will be developed by JLZ and submitted to IDEQ for approval.

Receipt of a Certificate of Completion from IDEQ shall indicate that JLZ has successfully implemented all intended actions and fulfilled all requirements for the Site as established in the Voluntary Remediation Agreement. Within thirty (30) days of receipt of IDEQ's Certificate of Completion, JLZ may request that IDEQ negotiate and provide a "covenant not to sue" as provided in Section 39-7207, Idaho Code.

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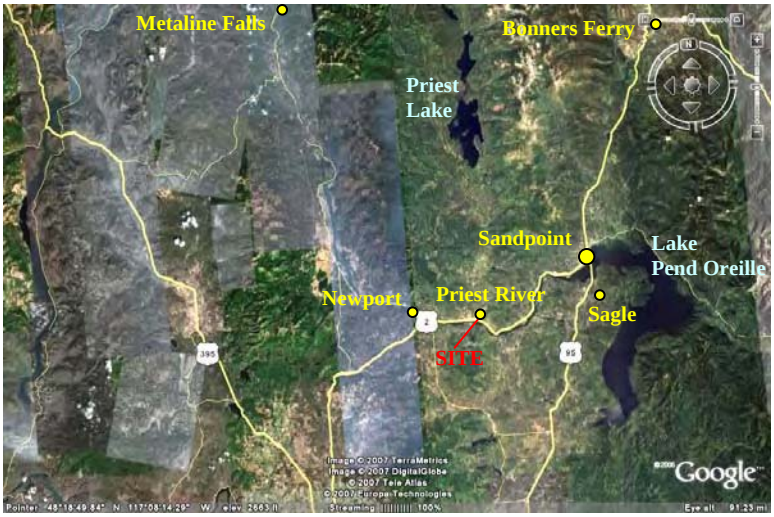
FIGURES

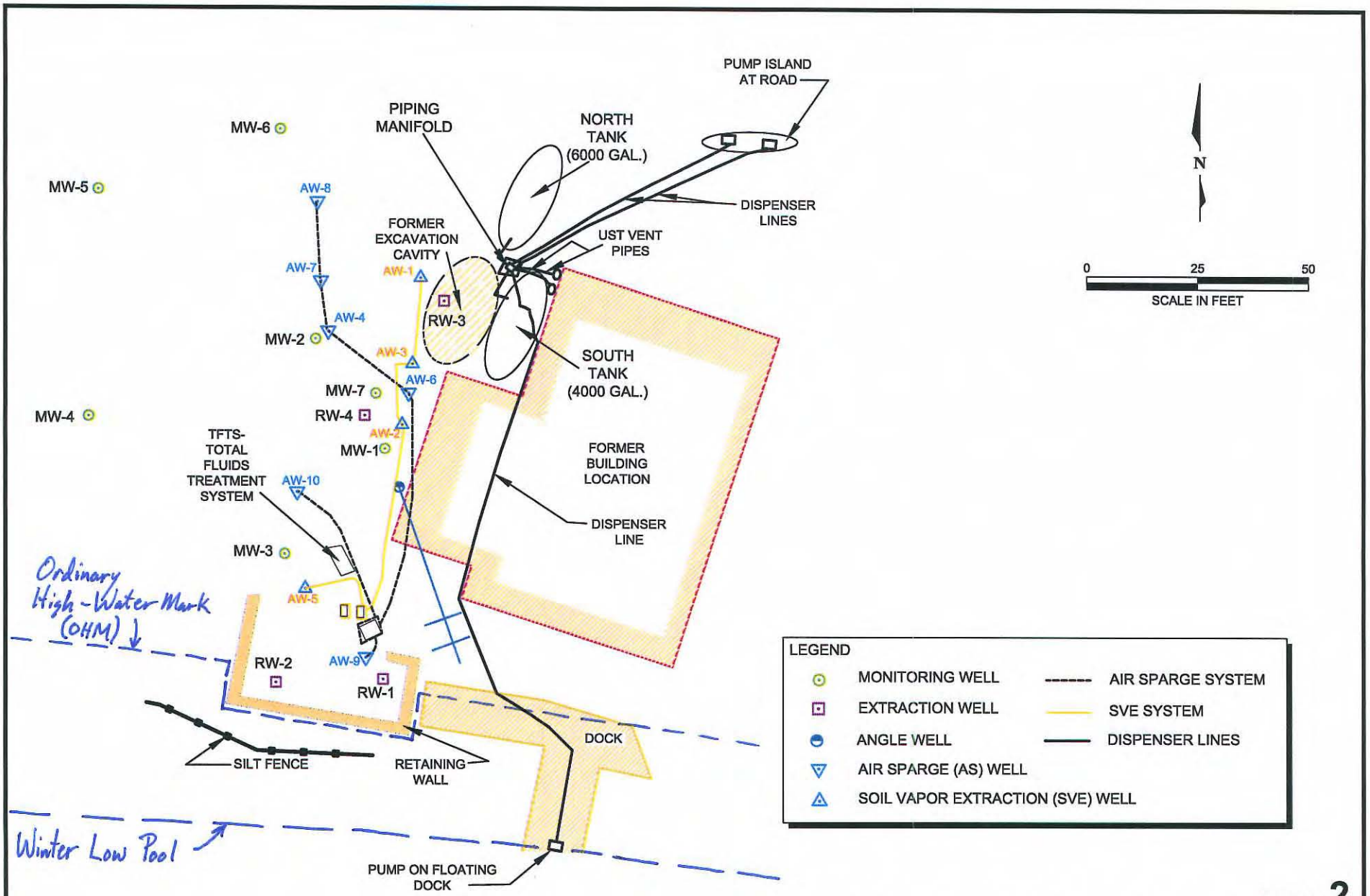


Vicinity Map

Location Map

FIGURE 1
SUBJECT PROPERTY LOCATION
FORMER DOCK-N-SHOP SITE
VOLUNTARY REMEDIATION WORK PLAN
JLZ ENTERPRISES INC.
Bonner County, Idaho

Golder Associates



NOTE: THE LOCATIONS OF FEATURES SHOWN ARE APPROXIMATE.

FIGURE **2**

LOCATION OF UST'S AND ASSOCIATED PIPING

DOCK-N-SHOP SITE REMEDIATION

Z:□Projects□2007 Projects□073-93053 Dock-N-Shop - Priest River□Dock-n-Shop.dwg | Model | Mod: 10/17/2007, 15:16 | Plotted: 10/17/2007, 15:16 | BBorer

Golder Associates

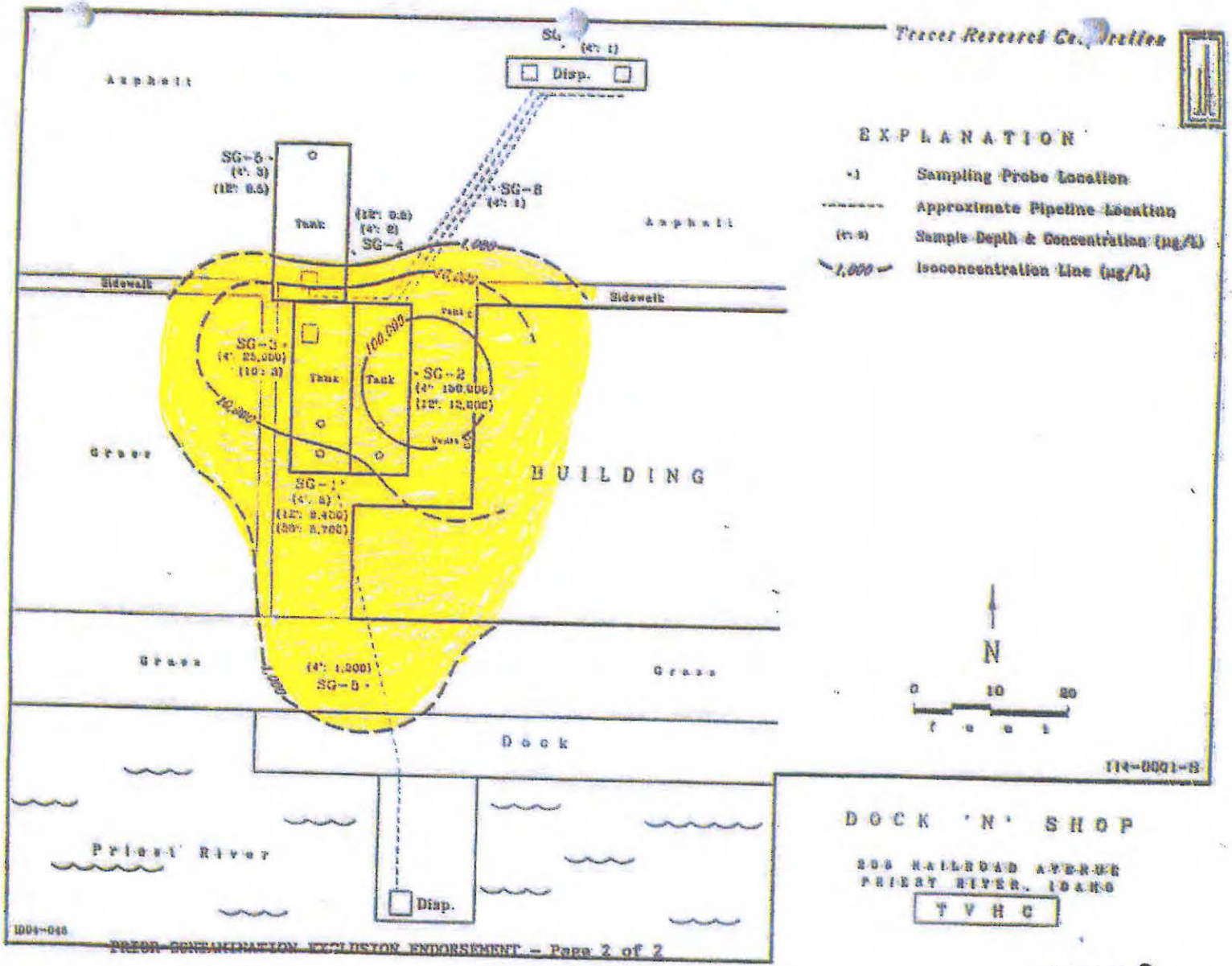


FIGURE 3

APPROXIMATE EXTENT OF SOIL PETROLEUM IMPACTS PRIOR TO 1994
BASED ON TRACER RESEARCH CORP (1994)

DOCN-N-SHOP SITE REMEDIATION

REFERENCE: Base drawing from PSTF Policy No.634

Golder Associates

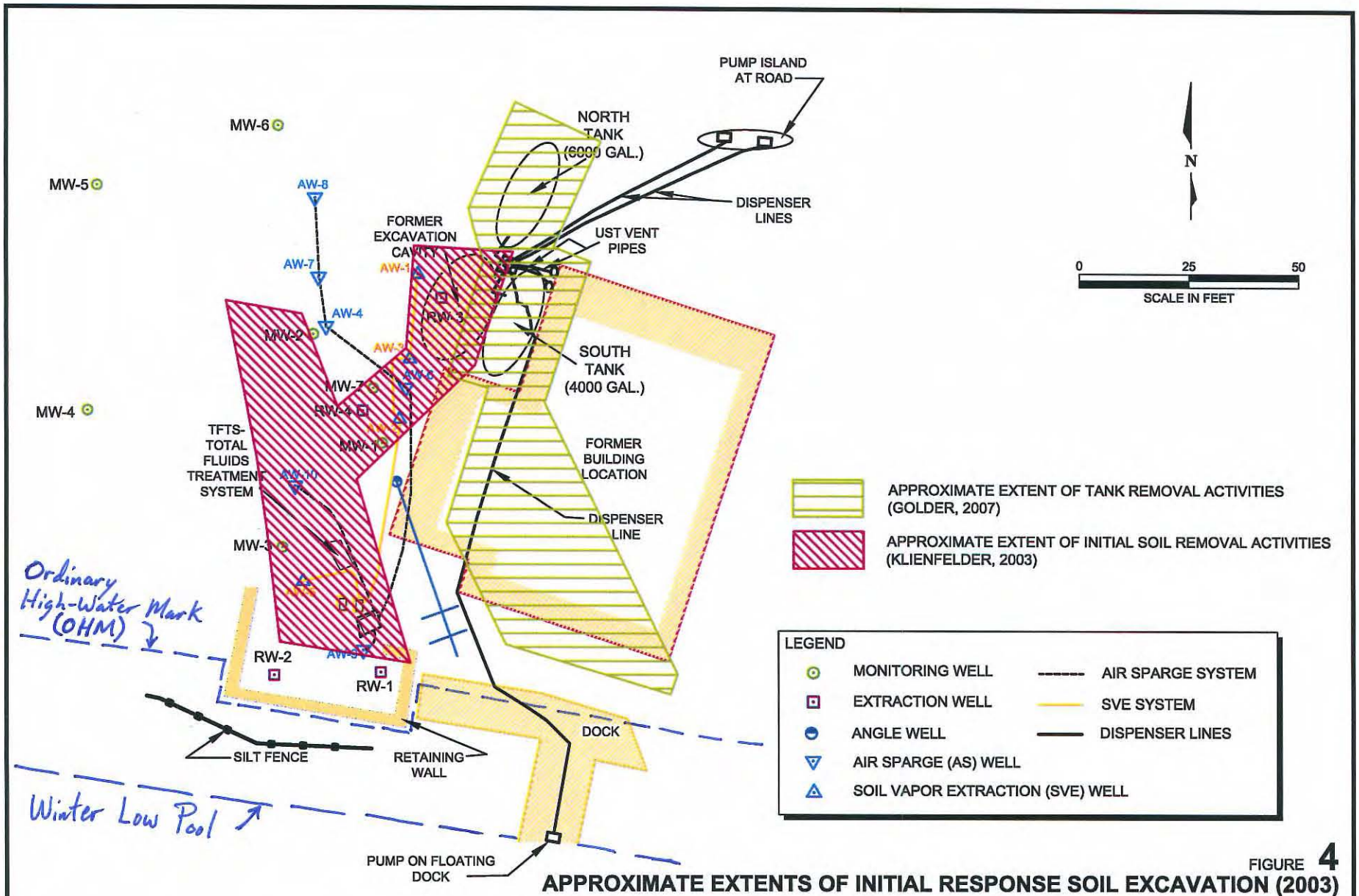


FIGURE **4**

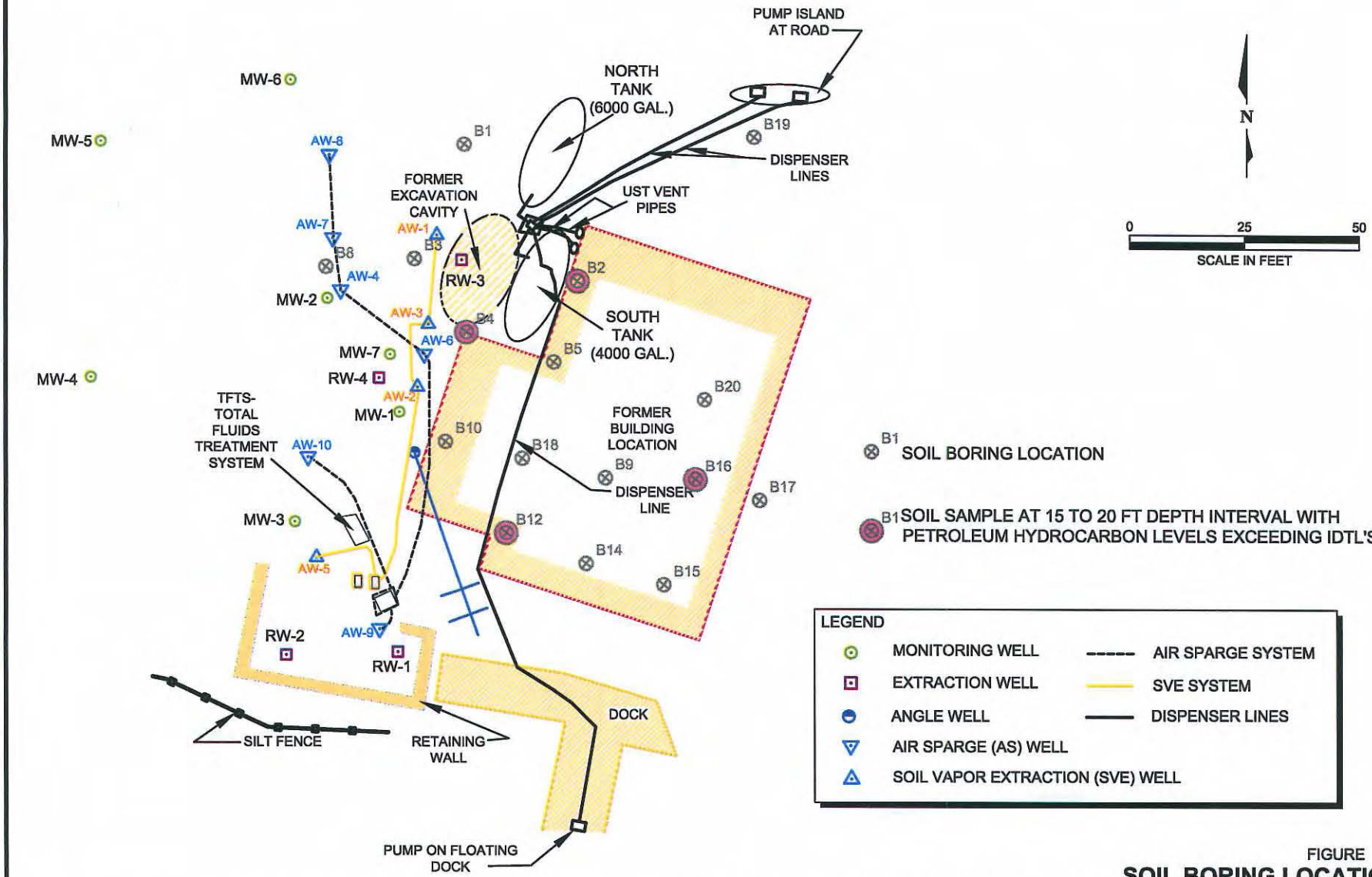
APPROXIMATE EXTENTS OF INITIAL RESPONSE SOIL EXCAVATION (2003) AND TANK REMOVAL ACTIVITIES (2007)

DOCK-N-SHOP SITE REMEDIATION

NOTE: THE LOCATIONS OF FEATURES SHOWN ARE APPROXIMATE.

C:\Documents and Settings\bborer\My Documents\Projects\073-93443 Dock-N-Shop Site Remediation\CAD-BB\CAD\Dock-n-Shop revi.dwg | Model | Mod: 12/03/2007, 16:41 | Plotted: 12/03/2007, 17:22 | BBorer

Golder Associates



NOTE: THE LOCATIONS OF FEATURES SHOWN ARE APPROXIMATE.

FIGURE **5**

SOIL BORING LOCATION

KLEINFELDER SOIL INVESTIGATION REPORT, DECEMBER 2006

DOCK-N-SHOP SITE REMEDIATION

C:\Documents and Settings\bborer\My Documents\Projects\073-93443 Dock-N-Shop Site Remediation\CAD-BB\CAD\Dock-n-Shop revi.dwg | Model | Mod: 12/03/2007, 16:41 | Plotted: 12/03/2007, 16:48 | BBorer

Golder Associates

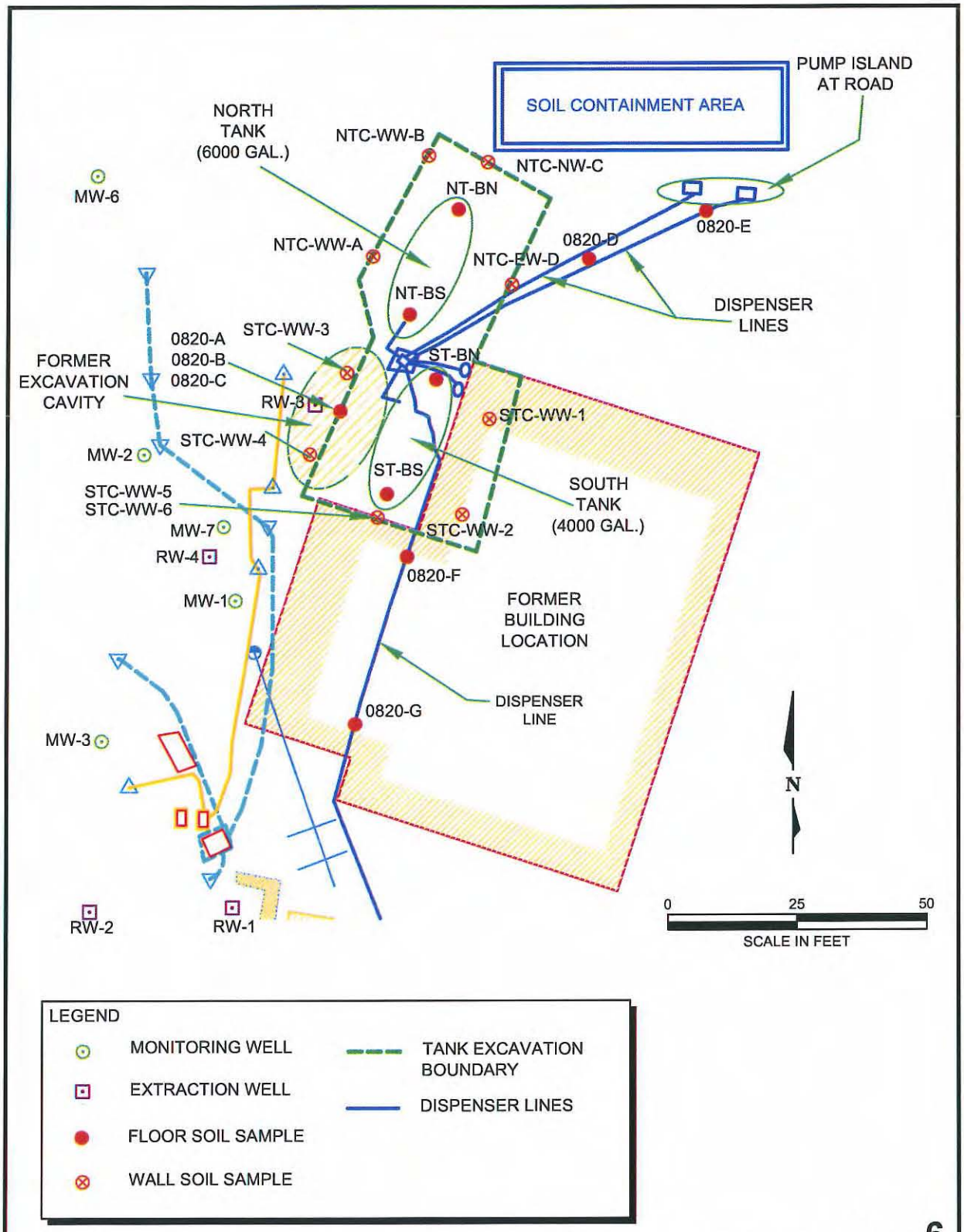
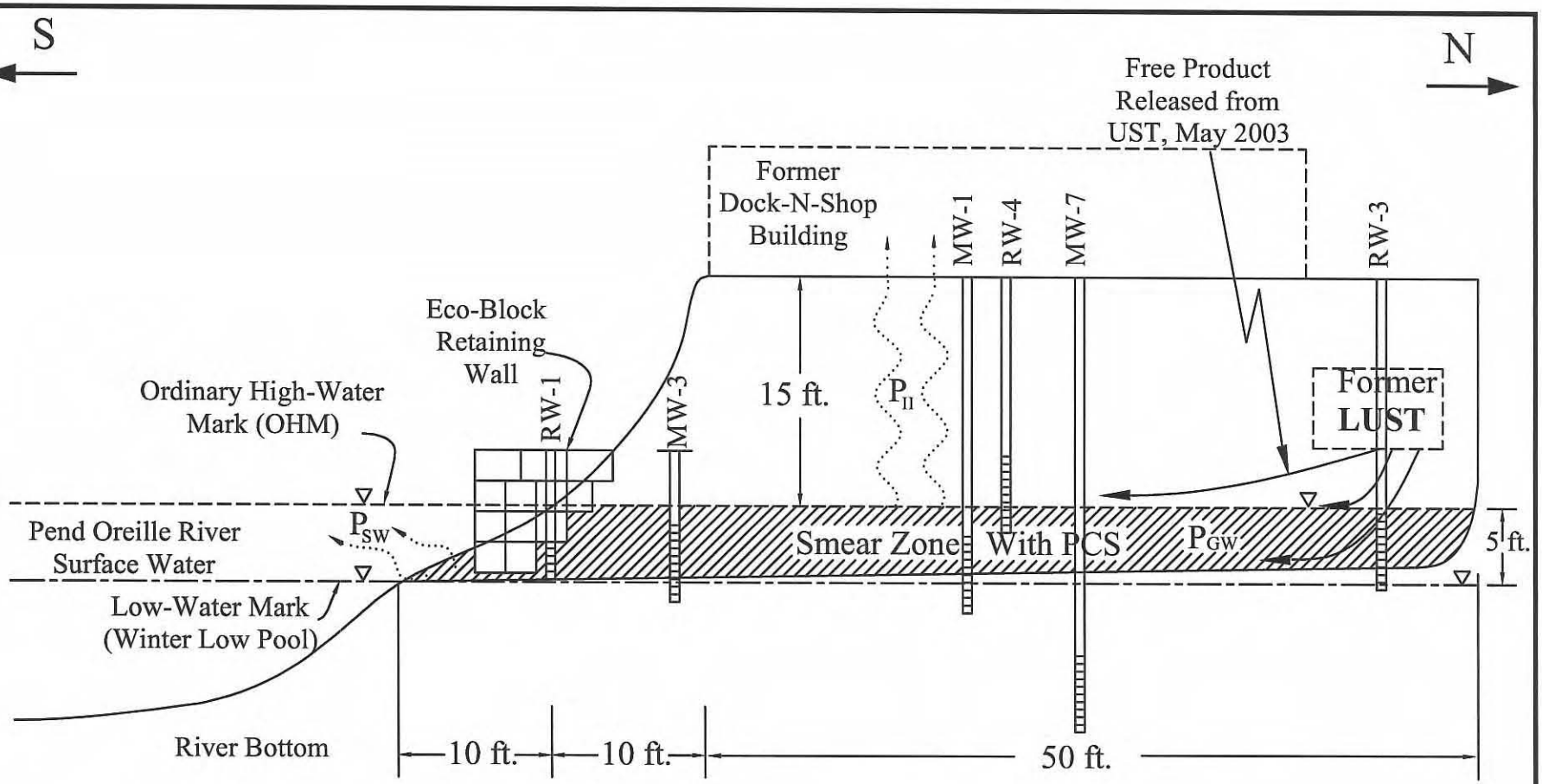


FIGURE **6**

GOLDER SOIL SAMPLE LOCATIONS, AUGUST 2007 (GOLDER, 2007)

DOCK-N-SHOP SITE REMEDIATION

Golder Associates



NOTES:
1) Excavation will accur during low flow of river and low groundwater condition
2) Excavation Area will be backfilled with clean silty gravel and graded to pre-existing contour and surface elevation
3) Scale is approximate

Groundwater Monitoring Well / Recovery Well with Screan Interval

P_{SW} = Surface Water Exposure Pathway

P_{GW} = Ground Water Exposure Pathway

P_{II} = Indoor Inhalation of Soil Vapor Emissions Pathway

CROSS-SECTION VIEW

FIGURE 7
SITE CONCEPTUAL MODEL
FORMER DOCK-N-SHOP SITE
JLZ ENTERPRISES INC.
VOLUNTARY REMEDIATION WORK PLAN
Bonner County, Idaho
12/14/07

Golder Associates

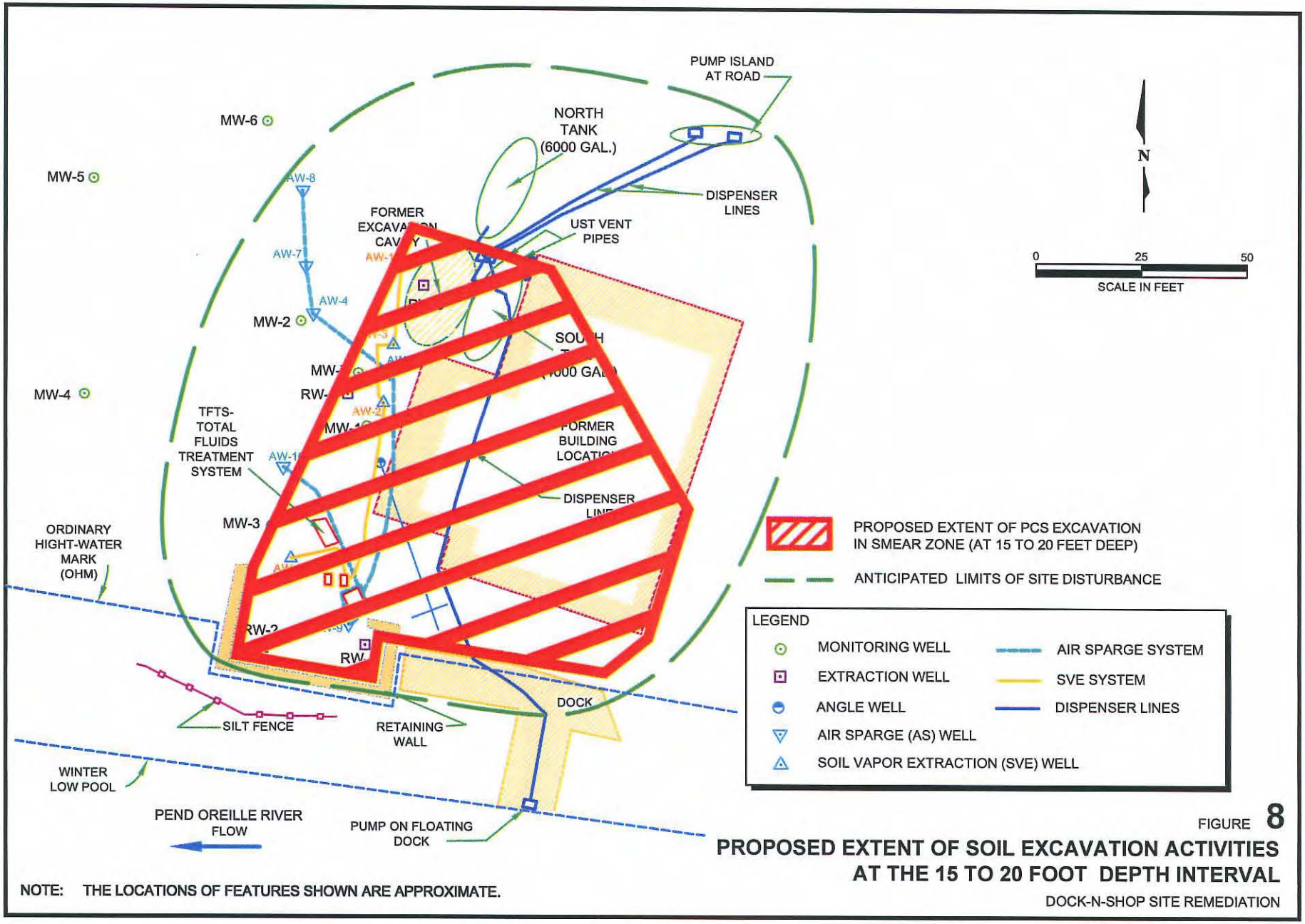


FIGURE **8**

PROPOSED EXTENT OF SOIL EXCAVATION ACTIVITIES AT THE 15 TO 20 FOOT DEPTH INTERVAL

DOCK-N-SHOP SITE REMEDIATION

NOTE: THE LOCATIONS OF FEATURES SHOWN ARE APPROXIMATE.

Golder Associates

APPENDIX A

IDEQ VOLUNTARY REMEDIATION PROGRAM

AGREEMENT APPLICATION

STATE OF IDAHO
DEPARTMENT OF ENVIRONMENTAL QUALITY
1410 N HILTON
BOISE, ID 83706
(208) 373-0502

ACCOUNT NUMBER:
SITE ID NUMBER:

IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY
VOLUNTARY REMEDIATION PROGRAM APPLICATION

PART 1: SITE LOCATION, OWNERSHIP, AND HISTORY INFORMATION

A. SITE NAME AND LOCATION

01. SITE NAME (LEGAL, COMMON, OR DESCRIPTIVE NAME OF SITE)	02. STREET, ROUTE NO. OR SPECIFIC LOCATION IDENTIFIER
Former Dock and Shop, also extends to west on vacant lot	**208 Railroad Ave.**

03. CITY	04. STATE	05. ZIP CODE	06. COUNTY
Priest River	**Idaho**	**83856**	**Bonner**

07. TOWNSHIP, RANGE, AND SECTION	08. TAX PARCEL ID.
56N 5W 25	**Subject property #S 2940, Affecting #S 2820, 2860, Impacting #S 2801, 2770, 2932, 2901**

B. APPLICANT INFORMATION

01. NAME (LAST NAME, FIRST NAME, MI)
JLZ Enterprises, Inc.
02. ADDRESS
PO Box 1335 (mailing address), 210 Meadow Lane (shipping address)
03. CITY
Sagle

04. STATE	05. ZIP CODE	06. TELEPHONE
Idaho	**83860**	**(208)265-8013**

C. OWNER/OPERATOR IDENTIFICATION (IF DIFFERENT FROM SECTION B, ABOVE)

01. OWNER	07 OPERATOR
Echo VanderWal	
02. OWNER ADDRESS	08. OPERATOR ADDRESS
03. CITY	09. CITY

04. STATE	05. ZIP CODE	06. TELEPHONE	10. STATE	11. ZIP CODE	12. TELEPHONE
		(208) 610-8218 cell			

D. CONTACT INFORMATION (IF DIFFERENT FROM SECTIONS B AND C ABOVE)

01. CONTACT PERSON AND TITLE
02. ADDRESS

03. CITY	04. STATE	05. ZIP CODE	06. TELEPHONE
			( )

E. SITE DESCRIPTION AND OPERATIONAL HISTORY

01. BRIEF DESCRIPTION AND OPERATIONAL HISTORY OF SITE (PLEASE PROVIDE ATTACHMENTS IF ADDITIONAL SPACE IS REQUIRED)

Leaking UST reported in 2003. Albar (previous owner and responsible party) hired Kleinfelder for response and cleanup of unleaded gasoline leaking from UST.

Currently, groundwater has been cleaned up to levels required by Idaho DEQ based on 2004 Consent Order cleanup levels. Soil impacts remain at the site above 2004 Consent Order cleanup levels. Residual soil contamination is not a direct threat to human health or the environment and may be completed efficiently and effectively with dig and haul option.

Subsurface soil contamination identified prior to 2003 UST release covers a larger area than recent soil impacted area, but may also be completed with dig and haul option.

Property sold to current owner, JLZ, in 2005, with cleanup action still in process. Site groundwater cleanup complete. Residual soil impacts still remain on site.

JLZ proposes to excavate petroleum contaminated soils (PCS), transport and dispose of PCS, backfill and compact excavation area after confirmation environmental sampling meets residential criteria. This would allow proposed development to occur.

PART 2. PROGRAM ELIGIBILITY

ELIGIBILITY

THIS SECTION OF THE APPPLICATION IS DESIGNED TO DETERMINE WHETHER THE APPLICANT MEETS THE CRITERIA FOR ELIGIBILITY UNDER THE IDAHO LAND REMEDIATION ACT (ILRA). PLEASE ANSWER YES, NO OR NOT SURE TO THE QUESTIONS BELOW. AN ANSWER "YES" TO ANY OF THESE QUESTIONS *MAY* RESULT IN A DETERMINATION THAT THE APPLICANT IS NOT ELIGIBLE TO PARTICIPATE IN THE ILRA. SUBMISSION OF MISLEADING OR FALSE INFORMATION WILL RENDER ANY APPROVAL GIVEN BY THE DEPARTMENT VOID.

01. IS THE PROPERTY SUBMITTED UNDER THIS APPLICATION LISTED OR PROPOSED FOR LISTING ON THE NATIONAL PRIORITIES LIST OF SUPERFUND SITES ESTABLISHED UNDER THE FEDERAL COMPREHENSIVE EMERGENCY RESPONSE, COMPENSATION AND LIABILITY ACT (CERCLA)?

☐ YES ☒ NO ☐ NOT SURE

02. IS THE PROPERTY SUBMITTED UNDER THIS APPLICATION SUBJECT TO A CORRECTIVE ACTION UNDER ORDERS OR AGREEMENTS ISSUED PURSUANT TO THE FEDERAL "RESOURCE CONSERVATION AND RECOVERY ACT OF 1976", AS AMENDED?

☐ YES ☒ NO ☐ NOT SURE

IF THE ANSWER IS YES, PLEASE PROVIDE ORDER OR AGREEMENT NUMBER: _____

03. IS THE PROPERTY SUBMITTED UNDER THIS APPLICATION A FACILITY WHICH HAS OR SHOULD HAVE A PERMIT OR INTERIM STATUS PURSUANT TO THE FEDERAL "RESOURCE CONSERVATION AND RECOVERY ACT OF 1976", AS AMENDED, (RCRA SUBTITLE C) FOR TREATMENT, STORAGE, OR DISPOSAL OF HAZARDOUS WASTE?

☐ YES ☒ NO ☐ NOT SURE

IF ANSWER IS YES, PLEASE PROVIDE PERMIT NUMBER: _____

04. IS REMEDIATION OF THE PROPERTY SUBMITTED UNDER THIS APPLICATION CURRENTLY REQUIRED PURSUANT TO ANY ORDER OR AGREEMENT OF THE STATE OR LOCAL GOVERNMENT?

☐ YES ☒ NO ☐ NOT SURE

05. ARE HAZARDOUS WASTES CURRENTLY, OR THROUGH PAST OPERATION, MANAGED ON THE PROPERTY SUBMITTED UNDER THIS APPLICATION WHICH ARE NOT OTHERWISE SUBJECT TO AN ENVIRONMENTAL PERMIT?

☐ YES ☒ NO ☐ NOT SURE

IF ANSWER IS YES, PLEASE PROVIDE AN EXPLANATION AS AN ATTACHMENT.

PART 3. ENVIRONMENTAL ASSESSMENTS

PROVIDE ASSESSMENT ATTACHMENTS

01. HAS A PHASE I ENVIRONMENTAL ASSESSMENT BEEN CONDUCTED FOR THE PROPERTY IN ACCORDANCE WITH CURRENT ASTM STANDARD PRACTICES, OR EQUIVALENT?

☐ YES DATE OF COMPLETION Pending Phase I from Golder + Assoc. ☐ NO

02. HAVE ADDITIONAL SITE INVESTIGATIONS (FOR EXAMPLE, A PHASE II ENVIRONMENTAL ASSESSMENT) BEEN CONDUCTED FOR THIS SITE?

☐ NONE ☒ PLANNED/ONGOING ☐ COMPLETE

per J2 Entire 10-2-07

APPLICANT SIGNATURE DATE

Echo T. VanderWal, Pres J2 Ent Inc

PRINTED NAME AND TITLE

APPENDIX B

PROPOSED SITE RE-DEVELOPMENT PLAN

BETTER SITES DESIGN SERVICE

BETTER SITES
Design Service
P.O. Box 345 Sandpoint, Idaho 83864
208 263-8399 phone or fax

March 17th, 2006

Planning Commission
City of Priest River
P.O. Box 415
Priest River, Idaho 83856

Subj: **Project Narrative – Resubmitted Conditional Use Permit Application**
Re: **Residential Condominiums – Waterfront east of Wisconsin Street**

Dear Planning Commission>

The project being proposed is to construct waterfront condominiums on combined parcels lying east of Wisconsin Street and south of Railroad Avenue, zoned commercial C-1. The project design calls for 69 framed, multi-storied units constructed over an underground parking structure in three phases. Access would be from a reconstructed and paved Railroad Avenue and would provide both covered and open-air on-site parking spaces.

This proposed project has unique merits of encouraging residential location within easy walking distance of your downtown commercial core area. This project will include the land, now vacant, at the intersection of Railroad Avenue and Wisconsin Street, extending past the previous Dock & Shop, and joining the closed restaurant with the small residence next to the Yacht Club. The concept of bringing higher density residential lifestyles to commercial cores has been done quite successfully by a number of communities. The effect upon the core commercial area tends to be one of revitalization for the other businesses. The effects on adjoining properties are extremely negligible.

The City of Priest River recently approved the conversion of this prior restaurant facility to residential apartments, so the concept has met with Priest River acceptance on a smaller scale. The marina will stay in operation, although an expansion and renovation of the marine facility is planned in a later phase of the project. The adjoining property to the west is Wisconsin Street and a utility plant and to the north is the railroad line and spur. This property faces the Pend Oreille River on the south and the mill across the water. No adverse effects upon any of those properties come to mind.

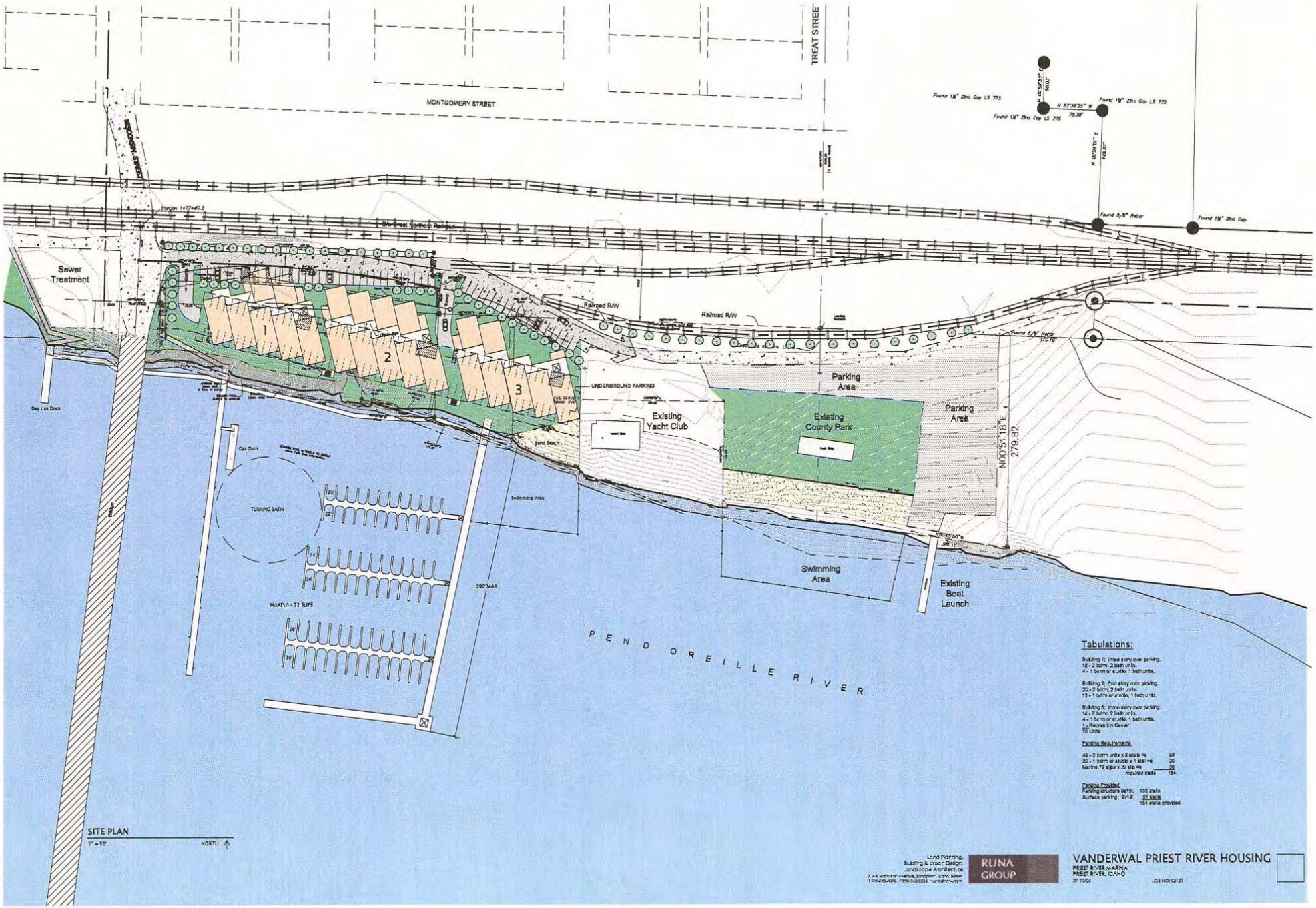
Our design calls for creating a 28-foot wide public easement along Railroad Avenue and pave this street for the length of this project. This would vastly improve access to Bonner Park West. Our understanding of the legal issues surrounding this proscriptive road right of way issue might be a welcome resolution for Public Works Department. There are some vague areas in an old easement given to Bonner County we are interested in helping the city resolve and finding unequivocal access to the park would benefit the whole community.

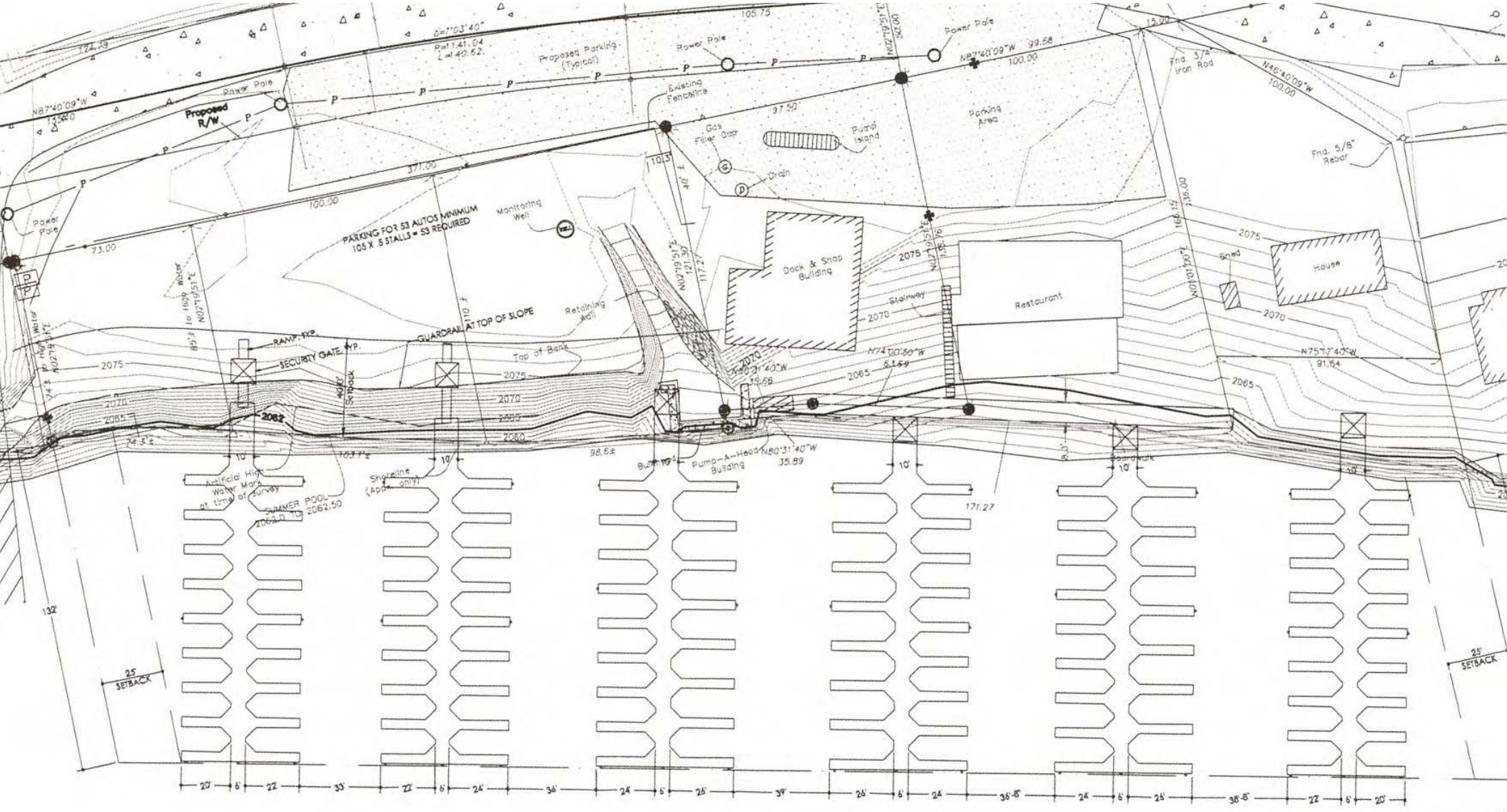
In closing, this project has great potential to be mutually beneficial to the applicant, the City of Priest River, and the downtown business district.

Appreciate your help with this.

Thank you,

Steve Klatt, Project Representative


MONTGOMERY STREET
TREAT STREE
Found 1/4" Zinc Cap LS 775
Found 1/4" Zinc Cap LS 775
Found 1/4" Zinc Cap LS 775
N 87°36'25" W
76.38'
Found 5/8" Rebar
Found 1/4" Zinc Cap
Sewer Treatment
Railroad R/W
Railroad R/W
Found 5/8" Rebar
1
2
3
UNDERGROUND PARKING
Parking Area
Existing Yacht Club
Existing County Park
Parking Area
N00°51'18"E
279.82'
Day Use Dock
Gas Dock
Sand Beach
TURNING BASIN
Swimming Area
390' MAX
MARINA - 72 SLIPS
Swimming Area
Existing Boat Launch
P E N D O R E I L L E R I V E R
SITE PLAN
1" = 50'
NORTH
Tabulations:
Building 1: three story over parking.
16 - 2 bdrm, 2 bath units.
4 - 1 bdrm or studio, 1 bath units.
Building 2: four story over parking.
20 - 2 bdrm, 2 bath units.
12 - 1 bdrm or studio, 1 bath units.
Building 3: three story over parking.
14 - 2 bdrm, 2 bath units.
4 - 1 bdrm or studio, 1 bath units.
1 - Recreation Center.
70 Units
Parking Requirements
48 - 2 bdrm units x 2 stalls re 96
20 - 1 bdrm or studio x 1 stall re 20
Marina 72 slips x .5/ slip re 36
required stalls 154
Parking Provided
Parking structure 9x19' 103 stalls
Surface parking 9x19' 51 stalls
154 stalls provided
Land Planning,
Building & Urban Design,
Landscape Architecture
RUNA GROUP
VANDERWAL PRIEST RIVER HOUSING
PRIEST RIVER MARINA
PRIEST RIVER, IDAHO



SUMMER POOL = 2062.0 TO 2062.5
Albeni Falls Dam Information

MARINA PLAN; ALTERNATE 'B'

NORTH

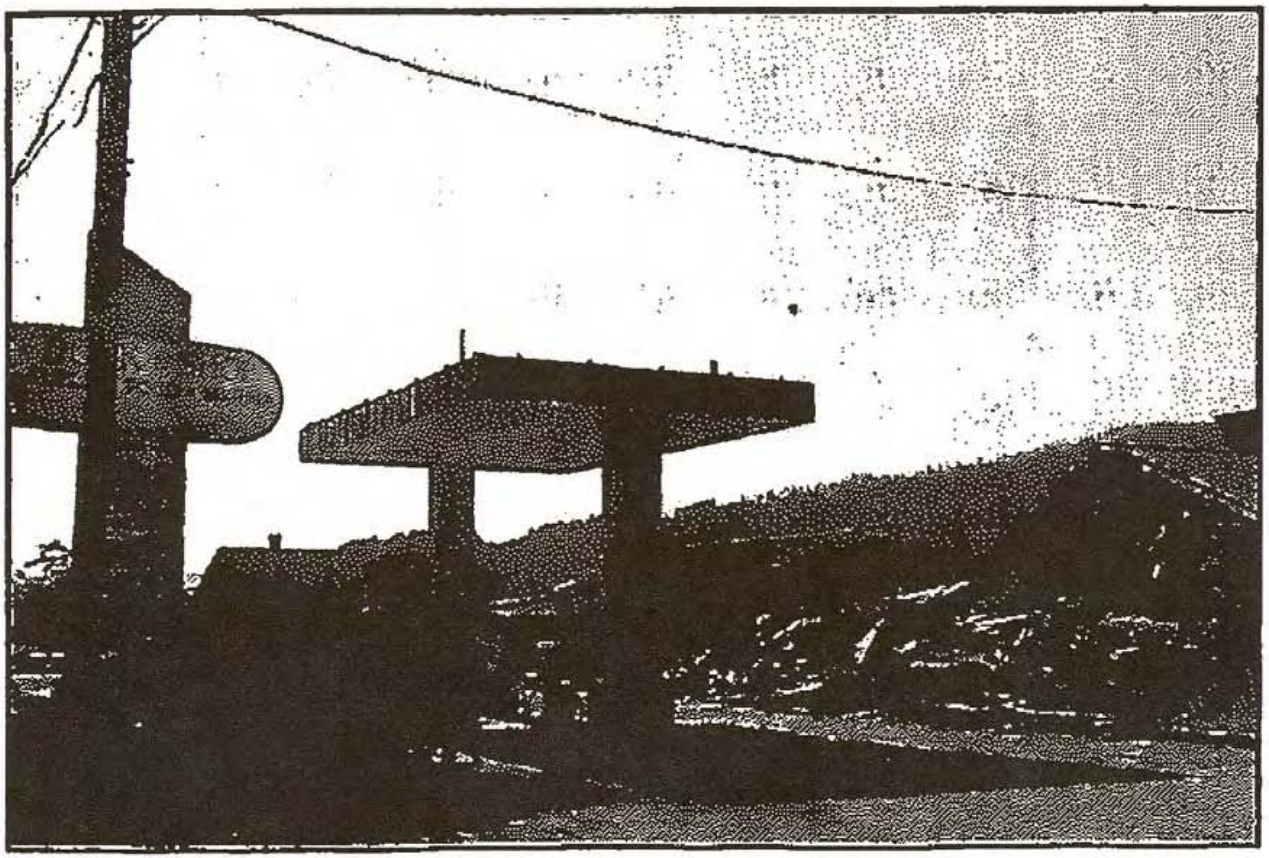
RUNA GROUP

PEND OREILLE RIVER MA

JLZ ENTERPRISES; PLANNING PHASE
PRIEST RIVER, IDAHO

Sept. 6, 2006

Dock-N-Shop demolition clears way for development



PRIEST RIVER— As demolition of the Dock-N-Shop comes to completion, Priest River Planning and Zoning will have to evaluate a proposal for a major waterfront development.

According to a letter submitted March 17 to the Priest River Planning Commission, U Z Enterprises Inc. of Sagle requested a conditional use permit for a proposed project of waterfront condominiums.

"The project design calls for 69 framed, multi-storied units constructed over an underground parking structure in three phases. Access would be from a reconstructed and paved Railroad Avenue and would provide both covered and open-air on-site parking spaces," said an excerpt from the letter submitted by Steve Klatt of Better Sites Design Service.

The project would include land spanning from the intersection of Wisconsin Street and Railroad Avenue, currently zoned commercial, extending beyond the Dock & Shop and joining the small residence next to the Yacht Club.

The project proposal has yet to go through Planning and Zoning. Public documents regarding the project are available for review at the Priest River City Hall.

APPENDIX C

SITE COC ANALYTICAL DETECTON SUMMARY

Representative Concentrations for Site Subsurface Soils

Constituents of Concern				Benzene	Toluene	Ethylbenzene	Total Xylenes	EDB	EDC	MTBE	Naphthalene
Sample Collection	Sample Date	Sample ID	Sample Depth (ft bgs)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Kleinfelder	2/19/2004	MW7-18	18	**0.24**	**25.7**	**12.8**	**77.5**	<0.002	<0.010	NA	**5.91**
Kleinfelder	2/19/2004	MW7-22	22	<0.010	<0.010	<0.010	<0.010	<0.002	<0.010	<0.010	0.28
Kleinfelder	5/4/2004	AW1-15	15	**5**	<0.010	<0.010	<0.010	<0.002	<0.010	<0.010	<0.010
Kleinfelder	5/4/2004	AW4-17.5	17.5	**0.141**	0.082	0.09	0.72	<0.002	<0.010	<0.010	0.316
Kleinfelder	5/4/2004	AW4-20	20	<0.010	0.042	0.043	0.333	<0.002	<0.010	<0.010	0.146
Kleinfelder	12/14/2006	B2	17.5	<0.0456	<0.228	3.78	**6.77**	<1.14	<0.228	<0.228	<0.456
Kleinfelder	12/14/2006	B4	15	<0.021	<0.105	<0.105	<0.42	<1.05	<1.05	<1.05	0.624
Kleinfelder	12/14/2006	B12	17.5	<0.245	**8.35**	**11.2**	**117.8**	<1.23	<1.23	<1.23	**7.27**
Kleinfelder	12/14/2006	B16	20	**0.0561**	<0.122	<0.122	<0.487	<1.22	<0.122	<0.122	<0.243
Kleinfelder	08/06/07	ST-BN	11'	**5.82**	**63.6**	**19.3**	**122.6**	< 1.11	< 6.17	< 6.17	**12.8**
Golder	08/06/07	ST-BN	11'	**15**	**150**	**49**	**239**	< 0.0012	< 0.0012	< 0.0012	**18**
Golder	08/20/07	0820-A-15	15'	< 0.24	0.28	**13**	**103**	< 0.24	< 0.24	< 0.24	**15**
IDEQ IDTLs				**0.0178**	**4.89**	**10.2**	**1.67**	**0.00014**	**0.0077**	**0.0364**	**1.14**
Average of 2 Highest Detections (Kleinfelder & Golder, 8/6/07)				10.41	106.8	34.15	180.8			1.900	15.4
Average of Detction Values				4.38	35.44	13.65	83.47				6.71
Overall Site Average				2.211	20.691	9.111	55.682	0.0001	0.005	0.474	5.058
Average of 2006 Soil Borings (Kleinfelder, 2007)				0.052	2.144	3.773	31.255			0.319	2.061

Representative Concentrations for Site Groundwater

Constituents of Concern		Benzene	Toluene	Ethylbenzene	Total Xylenes	EDB	EDC	MTBE	Naphthalene
Sample Collection Event	Sample ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Kleinfelder, 06/20/06	MW-1	**0.086**	0.14	0.0944	0.76	NA	NA	<0.005	<0.005
Kleinfelder, 06/20/06	RW-1	DRY	DRY	DRY	DRY	NA	NA	DRY	DRY
Kleinfelder, 06/20/06	RW-2	**0.0248**	<0.001	0.00839	0.00185	NA	NA	<0.005	0.0021
Kleinfelder, 06/20/06	RW-4	DRY	DRY	DRY	DRY	NA	NA	DRY	DRY
Kleinfelder, 09/22/06	MW-1	**0.14**	0.252	**0.234**	0.972	NA	NA	**0.061**	**0.225**
Kleinfelder, 09/22/06	RW-1	**0.049**	0.049	0.043	0.17	NA	NA	**0.059**	0.037
Kleinfelder, 09/22/06	RW-2	**0.0195**	0.0118	0.0127	0.0678	NA	NA	0.011	0.0408
Kleinfelder, 09/22/06	RW-4	**0.041**	0.093	0.047	0.235	NA	NA	0.012	0.0435
Kleinfelder, 06/14/07	MW-1	**0.0808**	0.054	0.0613	0.2931	NA	NA	<0.005	0.0243
Kleinfelder, 06/14/07	RW-1	**0.278**	0.0476	0.0471	0.2576	NA	NA	<0.005	0.0355
Kleinfelder, 06/14/07	RW-2	0.00426	<0.001	0.00348	<0.001	NA	NA	<0.005	0.00681
Kleinfelder, 06/14/07	RW-4	**0.0632**	0.0902	0.0326	0.2757	NA	NA	<0.005	0.0246
Kleinfelder, 09/27/07	MW-1	**0.023**	0.016	0.052	0.113	NA	NA	<0.005	0.045
Kleinfelder, 09/27/07	RW-1	0.00098	0.002	0.037	0.123	NA	NA	<0.005	0.029
Kleinfelder, 09/27/07	RW-2	0.00128	<0.001	<0.001	<0.001	NA	NA	<0.005	0.00118
Kleinfelder, 09/27/07	RW-4	**0.051**	0.027	0.054	0.099	NA	NA	<0.005	0.0195
IDEQ IDTLs		**0.005**	**1**	**0.7**	**4.34**	**0.00005**	**0.005**	**0.017**	**0.21**
4-Q AVERAGE		**0.062**	**0.056**	**0.052**	**0.241**			**0.012**	**0.038**

APPENDIX D

IDAHO RISK EVALUATION MANUAL (REM) CALCULATIONS

INPUT DATA

AND

OUTPUT TABLES

RECEPTOR(S) AND ROUTE(S) OF EXPOSURE

(Select by clicking the checkboxes)

SOURCE AND ROUTES OF EXPOSURES	RECEPTOR			
	RESIDENT		NON-RESIDENTIAL	CONSTRUCTION WORKER
	CHILD	AGE-ADJUSTED		
Surficial Soil Ingestion of Soil, Outdoor Inhalation of Vapor Emissions and Particulates, and Dermal Contact with Soil	☐	☐	☑	☑
Subsurface Soil Indoor Inhalation of Vapor Emissions	☑	☑	☑	
Groundwater Indoor Inhalation of Vapor Emissions	☑	☑	☑	
Soil-Vapor (RE-2 only) Indoor Inhalation of Vapor Emissions	☐	☐	☐	

☐ **Groundwater Protection**

☐	**Option 1.**	**Groundwater with Current Use or High Probability of Future Use as Drinking Water**: The Maximum Contaminant Levels (MCLs) are used as the target concentrations at the POE. For chemicals without MCLs, risk-based ingestion standard for an age-adjusted adult is used.
☑	**Option 2.**	**Groundwater with Low Probability of Future Use as Drinking Water**: Groundwater concentrations protective of off-site receptors resulting from exposure via pathways other than direct ingestion. These pathways include but are not limited to volatilization to indoor air, irrigation water use with crop uptake and ingestion, and irrigation water use without crop uptake.

☑ **Surface Water Protection**

If a surface water body is impacted or threatened, complete the following:	
Surface water is used for drinking/water quality is appropriate for drinking water supplies?	☑
Surface water supports aquatic life?	☑
Surface water is used for recreational activities?	☑
If Ammonia is a potential COC for surface water, complete the following:	
Surface water supports cold water aquatic species?	☑
Surface water supports warm water aquatic species?	☑

Former Dock N Shop
RE-1 EXPOSURE FACTORS

(Page 1 of 2)

Parameter	Symbol	Unit	Default Value	Value Used	Comment
	AT_c	year	70	70	*Default*
	AT_{nc}	year	=ED	=ED	*Default*
Body Weight:					
Resident Child	BW_c	kg	15	15	*Default*
Resident Adolescent	BW_{as}	kg	55	55	*Default*
Resident Adult	BW_a	kg	70	70	*Default*
Non-residential	BW_{com}	kg	70	70	*Default*
Construction Worker	BW_{con}	kg	70	70	*Default*
Exposure Duration:					
Resident Child	ED_c	year	6	6	*Default*
Resident Adolescent	ED_{as}	year	9	9	*Default*
Resident Adult	ED_a	year	15	15	*Default*
Age-adjusted Resident	ED_{as}	year	30	30	*Default*
Non-residential	ED_{com}	year	6.6	6.6	*Default*
Construction Worker	ED_{con}	year	1	1	*Default*
Exposure Frequency for Indirect Pathways:					
Resident Child	EF_c	day/year	350	350	*Default*
Resident Adolescent	EF_{as}	day/year	350	350	*Default*
Resident Adult	EF_a	day/year	350	350	*Default*
Non-residential	EF_{com}	day/year	250	250	*Default*
Construction Worker	EF_{con}	day/year	30	30	*Default*
Exposure Frequency for Direct Contact Pathways					
Resident Child	EF_{dc}	day/year	270	270	*Default*
Resident Adolescent	EF_{das}	day/year	270	270	*Default*
Resident Adult	EF_{da}	day/year	270	270	*Default*
Non-residential	EF_{dcom}	day/year	180	180	*Default*
Construction Worker	EF_{dcon}	day/year	30	30	*Default*
Indoor Exposure Time:					
Resident Child	ET_{i-c}	hrs/day	21	21	*Default*
Resident Adolescent	ET_{i-as}	hrs/day	15.8	15.8	*Default*
Resident Adult	ET_{i-a}	hrs/day	15	15	*Default*
Non-residential	ET_{i-com}	hrs/day	7.5	7.5	*Default*
Outdoor Exposure Time:					
Resident Child	ET_{o-c}	hrs/day	2	2	*Default*
Resident Adolescent	ET_{o-as}	hrs/day	2	2	*Default*
Resident Adult	ET_{o-a}	hrs/day	2	2	*Default*
Non-residential	ET_{o-com}	hrs/day	6	6	*Default*
Construction Worker	ET_{o-con}	hrs/day	10	10	*Default*
Soil Ingestion Rate:					
Resident Child	IR_{s-c}	mg/day	200	200	*Default*
Resident Adolescent	IR_{s-as}	mg/day	100	100	*Default*
Resident Adult	IR_{s-a}	mg/day	100	100	*Default*
Age-adjusted	**IR_{s-as}**	**mg/kg**	**31804**	**31804**	***Default***
Non-residential	IR_{s-com}	mg/day	100	100	*Default*
Construction Worker	IR_{s-con}	mg/day	480	480	*Default*
Groundwater Ingestion Rate:					
Resident Child	IR_{w-c}	L/day	1.5	1.5	*Default*
Resident Adolescent	IR_{w-as}	L/day	1.7	1.7	*Default*
Resident Adult	IR_{w-a}	L/day	2	2	*Default*
Age-adjusted	**IR_{w-as}**	**L/kg**	**457.36**	**457.36**	***Default***
Non-residential	IR_{w-com}	L/day	1	1	*Default*
Hourly Indoor Inhalation Rate:					
Resident Child	IR_{ai-c}	m^3/hr	0.7	0.7	*Default*
Resident Adolescent	IR_{ai-as}	m^3/hr	0.7	0.7	*Default*
Resident Adult	IR_{ai-a}	m^3/hr	0.7	0.7	*Default*
Non-residential	IR_{ai-com}	m^3/hr	1	1	*Default*
Hourly Outdoor Inhalation Rate:					
Resident Child	IR_{ao-c}	m^3/hr	1.1	1.1	*Default*
Resident Adolescent	IR_{ao-as}	m^3/hr	1.3	1.3	*Default*
Resident Adult	IR_{ao-a}	m^3/hr	1.3	1.3	*Default*
Non-residential	IR_{ao-com}	m^3/hr	1.6	1.6	*Default*
Construction Worker	IR_{ao-con}	m^3/hr	2.4	2.4	*Default*
Indoor Inhalation Rate:					
Resident Child	**IR_{ai-c}**	**m^3/day**	**14.7**	**14.7**	***Default***
Resident Adolescent	**IR_{ai-as}**	**m^3/day**	**11.1**	**11.1**	***Default***
Resident Adult	**IR_{ai-a}**	**m^3/day**	**10.5**	**10.5**	***Default***
Age-adjusted (calculated)	**IR_{ai-as}**	**m^3/kg**	**3478.9**	**3478.9**	***Default***
Commercial Worker	**IR_{ai-com}**	**m^3/day**	**7.5**	**7.5**	***Default***

EXPOSURE FACTORS

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Parameter	Symbol	Unit	Default Value	Value Used	Comment
Outdoor Inhalation Rate:					
Resident Child	IR_{ao-c}	m^3/day	2.2	2.2	*Default*
Resident Adolescent	IR_{ao-as}	m^3/day	2.6	2.6	*Default*
Resident Adult	IR_{ao-a}	m^3/day	2.6	2.6	*Default*
Age-adjusted	IR_{ao-as}	m^3/kg	**502.9**	**502.9**	***Default***
Non-residential	IR_{ao-com}	m^3/day	9.6	9.6	*Default*
Construction Worker	IR_{ao-con}	m^3/day	24	24	*Default*
Skin Surface Area:					
Resident Child	SA_c	cm^2/day	2434	2434	*Default*
Resident Adolescent	SA_{as}	cm^2/day	2434	2434	*Default*
Resident Adult	SA_a	cm^2/day	5657	5657	*Default*
Age-adjusted	SA_{as}	mg/kg	**393322.9**	**393322.9**	***Default***
Non-residential	SA_{com}	cm^2/day	3477	3477	*Default*
Construction Worker	SA_{con}	cm^2/day	3477	3477	*Default*
Soil to Skin Adherence Factor:					
Resident Child	M_c	mg/cm^2	1	1	*Default*
Resident Adolescent	M_{as}	mg/cm^1	0.3	0.3	*Default*
Resident Adult	M_a	mg/cm^2	0.3	0.3	*Default*
Non-residential	M_{com}	mg/cm^2	0.1	0.1	*Default*
Construction Worker	M_{con}	mg/cm^2	0.5	0.5	*Default*
Averaging Time for Vapor Flux:					
Resident Child	τ	s	1.89E+08	**1.89E+08**	***Calculated***
Resident Adolescent	τ	s	2.84E+08	**2.84E+08**	***Calculated***
Resident Adult	τ	s	4.73E+08	**4.73E+08**	***Calculated***
Age-adjusted Resident	τ	s	9.46E+08	**9.46E+08**	***Calculated***
Commercial Worker	τ	s	2.08E+08	**2.08E+08**	***Calculated***
Construction Worker	τ	s	3.15E+07	**3.15E+07**	***Calculated***
Target Site Risk	TR	--	1.00E-05	1.00E-05	*Default*
Target Site Hazard Quotient	THI	--	1	1	*Default*

RE-1 FATE AND TRANSPORT PARAMETERS

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Parameter	Symbol	Unit	Default Value	Value Used	Comment
SOIL PARAMETERS:					
Source-building separation	L_{TS}	cm	30	460	*Provide Justification*
Source-bottom-building separation	L_{TS-B}	cm	183	610	*Provide Justification*
Number of distinct soil strata between the top of the source zone and the building foundation	n_S	-	1	2	*Provide Justification*
SOIL-VAPOR PARAMETERS:					
Depth to sample from the bottom of the building	L_{TSV}	cm	91	600	*Provide Justification*
GROUNDWATER PARAMETERS:					
Groundwater-building separation	L_{TGW}	cm	30	600	*Provide Justification*
Number of distinct soil strata between the capillary fringe and the building foundation	n_{GW}	-	1	2	*Provide Justification*
AIR PARAMETERS:					
Viscosity of air	μ	g/cm-s	1.80E-04	1.80E-04	*Default*
ENCLOSED SPACE PARAMETERS:					
Area of the enclosed space below grade:					
Residential	A_B	cm^2	1561600	1561600	*Default*
Non-residential	A_B	cm^2	4782069	4782069	*Default*
Enclosed Space Foundation/Wall Thickness:					
Residential	L_{crack}	cm	15	15	*Default*
Non-residential	L_{crack}	cm	15	15	*Default*
Total area of cracks:					
Residential	A_{crack}	cm^2	484	484	*Default*
Non-residential	A_{crack}	cm^2	861	861	*Default*
Number of air exchanges per second:					
Residential	ER	1/sec	2.78E-04	2.78E-04	*Default*
Non-residential	ER	1/sec	5.56E-04	5.56E-04	*Default*
Length of enclosed space:					
Residential	L_B	cm	1220	1220	*Default*
Non-residential	L_B	cm	2157	2157	*Default*
Width of enclosed space:					
Residential	W_B	cm	1220	1220	*Default*
Non-residential	W_B	cm	2157	2157	*Default*
Height of enclosed space:					
Residential	H_B	cm	244	244	*Default*
Non-residential	H_B	cm	244	244	*Default*
Floor-wall seam perimeter:					
Residential	X_{crack}	cm^2/cm^2	4880	4880	*Default*
Non-residential	X_{crack}	cm^2/cm^2	8628	8628	*Default*
Crack depth below grade	Z_{crack}	cm	15	15	*Default*
Equivalent crack radius	r_{crack}	cm	0.1	0.1	*Default*
Pressure differential between enclosed space and soil surface beneath	ΔP	$g/cm\text{-}s^2$	40	40	*Default*
Building ventilation rate:					
Residential	$Q_{building}$	cm^3/s	1.01E+05	**1.01E+05**	*Calculated*
Non-residential	$Q_{building}$	cm^3/s	6.31E+05	**6.31E+05**	*Calculated*
Volumetric flow rate of soil gas into the enclosed space:					
Residential	Q_{soil}	cm^3/s	6.0E+00	**6.0E+00**	*Calculated*
Non-residential	Q_{soil}	cm^3/s	1.1E+01	**1.1E+01**	*Calculated*
COWHERD PARTICULATE EMISSION MODEL:					
Inverse of mean concentration in the middle of a sqaure source	Q/C	$[g/m^2\text{-}s]/[kg/m^3]$	**69.41**	**69.41**	*Calculated*
Fraction of Vegetative Cover	V	m^2/m^2	0.5	0.5	*Default*
Mean Annual Wind Speed	U_m	m/s	3.98	3.98	*Default*
Equivalent Threshold Value of Windspeed at 7m	U_t	m/s	11.32	11.32	*Default*
Windspeed Distribution Function from Cowherd et. al, 1985	F(x)	--	0.0495	0.0495	*Default*

FATE AND TRANSPORT PARAMETERS

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Parameter	Symbol	Unit	Default Value	Value Used	Comment
GROUNDWATER PROTECTION PARAMETERS:					
Groundwater Darcy Velocity	U_{gw}	cm/year	3340	3340	*Default*
Groundwater Mixing Zone Length	L_{mz}	cm	1220	1220	*Default*
Groundwater Mixing Zone Thickness	δ_{gw}	cm	153	153	*Default*
Groundwater Mixing Zone Width	W_{gw}	cm	1220	1220	*Default*
Infiltration Rate	I	cm/year	25	25	*Default*
Source Zone Soil Properties:					
Dry Soil Bulk Density of the source zone soil	ρ_s	g/cm^3	1.64	1.64	*Default*
Fractional Organic Carbon Content in the source zone soil	foc	g-C/g-soil	0.001	0.001	*Default*
Total Soil Porosity of the source zone soil	θ_T	cm^3/cm^3-soil	0.39	0.39	*Default*
Volumetric Water Content in the source zone soil	θ_{ws}	cm^3/cm^3	0.17	0.17	*Default*
Volumetric Air Content in the source zone soil	θ_{as}	cm^3/cm^3	0.22	**0.22**	***Calculated***
Saturated Zone Soil Properties:					
Dry Soil Bulk Density of the saturated zone soil	ρ_{ss}	g/cm^3	1.64	1.64	*Default*
Fractional Organic Carbon Content in the saturated zone soil	focs	g-C/g-soil	0.001	0.001	*Default*
Total Soil Porosity in the saturated zone soil	θ_{Ts}	cm^3/cm^3-soil	0.39	0.39	*Default*
Distance to the Point of Exposure (Xpoe)	Xpoe,gw	ft	variable	0	*User-Defined*
Longitudinal dispersivity	α_x	ft	**variable**	**0.000**	***Calculated***
Transverse dispersivity	α_y	ft	**variable**	**0.000**	***Calculated***
Vertical dispersivity	α_z	ft	**variable**	**0.000**	***Calculated***
Distance to the Point of Compliance (Xpoc)	Xpoc,gw	ft	variable	0	*User-Defined*
Longitudinal dispersivity	α_x	ft	**variable**	**0.000**	***Calculated***
Transverse dispersivity	α_y	ft	**variable**	**0.000**	***Calculated***
Vertical dispersivity	α_z	ft	**variable**	**0.000**	***Calculated***
SURFACE WATER PROTECTION PARAMETERS:					
pH of the receiving surface water	pH	--	7	7	*Default*
Temperature of the receiving surface water	T	^{0}C	15	15	*Default*
Hardness of the receiving surface water	H	mg/L (as $CaCO_3$)	25	25	*Default*
Distance to the Point of Exposure (Xpoe)	Xpoe,sw	ft	variable	0	*User-Defined*
Longitudinal dispersivity	α_x	ft	**variable**	**0.000**	***Calculated***
Transverse dispersivity	α_y	ft	**variable**	**0.000**	***Calculated***
Vertical dispersivity	α_z	ft	**variable**	**0.000**	***Calculated***
Distance to the Point of Compliance (Xpoc)	Xpoc,sw	ft	variable	0	*User-Defined*
Longitudinal dispersivity	α_x	ft	**variable**	**0.000**	***Calculated***
Transverse dispersivity	α_y	ft	**variable**	**0.000**	***Calculated***
Vertical dispersivity	α_z	ft	**variable**	**0.000**	***Calculated***

RE-1 FATE AND TRANSPORT PARAMETERS

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Parameter	Symbol	Unit	Default Value	Value Used	Comment
Thickness of Soil Strata Between the Source and the Bottom of the Building:					
Stratum A (Immediately below the building)	h_A	cm	30	200	*Provide Justification*
Stratum B	h_B	cm	0	400	*Provide Justification*
Stratum C	h_C	cm	0	0	*Default*
Total thickness (should equal the source-building separation)	L_{TS}	cm	30	**460**	*Check Stratum Thicknesses*
Thickness of Soil Strata Between Groundwater and the Bottom of the Building:					
Stratum A (Immediately below the building)	h_A	cm	5	200	*Provide Justification*
Stratum B	h_B	cm	0	300	*Provide Justification*
Stratum C	h_C	cm	0	0	*Default*
Stratum D (Capillary fringe)	h_{cap}	cm	25	**25**	***Calculated***
Total thickness (should equal the water table-building separation)	L_{TGW}	cm	30	**600**	*Check Stratum Thicknesses*
Stratum-Specific Properties:					
Stratum A (Immediately below the building):					
Vapor permeability	k_v	cm^2	5.00E-09	5.00E-09	*Default*
Dry Soil Bulk Density	ρ_{sA}	g/cm^3	1.64	1.64	*Default*
Fractional Organic Carbon Content	foc_A	g-C/g-soil	0.001	0.001	*Default*
Total Soil Porosity	θ_{TA}	cm^3/cm^3-soil	0.39	0.39	*Default*
Volumetric Water Content in Stratum A	θ_{wsA}	cm^3/cm^3	0.17	0.17	*Default*
Volumetric Air Content in Stratum A	θ_{asA}	cm^3/cm^3	0.22	**0.22**	***Calculated***
Stratum B:					
Dry Soil Bulk Density	ρ_{sB}	g/cm^3	1.64	1.64	*Default*
Fractional Organic Carbon Content	foc_B	g-C/g-soil	0.001	0.001	*Default*
Total Soil Porosity	θ_{TB}	cm^3/cm^3-soil	0.39	0.39	*Default*
Volumetric Water Content in Stratum B	θ_{wsB}	cm^3/cm^3	0.17	0.17	*Default*
Volumetric Air Content in Stratum B	θ_{asB}	cm^3/cm^3	0.22	**0.22**	***Calculated***
Stratum C:					
Dry Soil Bulk Density	ρ_{sC}	g/cm^3	1.64	1.64	*Default*
Fractional Organic Carbon Content	foc_C	g-C/g-soil	0.001	0.001	*Default*
Total Soil Porosity	θ_{TC}	cm^3/cm^3-soil	0.39	0.39	*Default*
Volumetric Water Content in Stratum C	θ_{wsC}	cm^3/cm^3	0.17	0.17	*Default*
Volumetric Air Content in Stratum C	θ_{asC}	cm^3/cm^3	0.22	**0.22**	***Calculated***
Stratum D (Capillary fringe):					
Mean particle diameter	D	cm	0.03	0.03	*Default*
van Genuchten curve shape factor	N	-	1.449	1.449	*Default*
Dry Soil Bulk Density	ρ_{sF}	g/cm^3	1.64	1.64	*Default*
Fractional Organic Carbon Content	foc_F	g-C/g-soil	0.001	0.001	*Default*
Total Soil Porosity	θ_{Tcap}	cm^3/cm^3-soil	0.39	0.39	*Default*
Residual water content in capillary fringe soil	θ_{rcap}	cm^3/cm^3	0.039	0.039	*Default*
Volumetric Water Content in capillary fringe	θ_{wcap}	cm^3/cm^3	0.322	**0.322**	***Calculated***
Volumetric Air Content in capillary fringe	θ_{acap}	cm^3/cm^3	0.068	0.068	***Calculated***

RE-1 REPRESENTATIVE CONCENTRATIONS FOR RESIDENTIAL RECEPTORS

CHEMICALS OF CONCERN	SURFICIAL SOIL	SUB-SURFACE SOIL	GROUNDWATER	SOIL-VAPOR	GROUNDWATER AND/OR SURFACE WATER PROTECTION		
	Inhalation of Vapors and Particulates, Dermal Contact, and Accidental Ingestion	Indoor Inhalation of Vapor Emissions	Indoor Inhalation of Vapor Emissions	Indoor Inhalation of Vapor Emissions	Representative Groundwater Concentration at the Source [mg/L]	Representative Soil Concentration at the Source [mg/kg]	Representative Groundwater Concentration at the POC [mg/L]
	NOT REQUIRED-PATHWAY NOT COMPLETE	Representative Concentration [mg/kg]	Representative Concentration [mg/L]	USE OF SOIL-VAPOR DATA IS NOT ALLOWED UNDER RE-1		NOT USED IN CALCULATIONS	
1,2-Dichloroethane	1.00E-02	6.00E-04					
Benzene	1.00E-02	1.50E+01	6.20E-02		6.20E-02		
Ethylbenzene	1.00E-02	4.90E+01	5.20E-02		5.20E-02		
Ethylene dibromide(EDB)	1.00E-02	6.00E-04					
MTBE	1.00E-02	6.00E-04	1.20E-02		1.20E-02		
Naphthalene	1.00E-02	1.80E+01	3.80E-02		3.80E-02		
Toluene	1.00E-02	1.50E+02	5.60E-02		5.60E-02		
Total Xylenes	1.00E-02	2.39E+02	2.41E-01		2.41E-01		

Notes: **Source Data from Kleinfelder Soil Boring Investigation, December 2006**

RE-1 REPRESENTATIVE CONCENTRATIONS FOR NON-RESIDENTIAL RECEPTORS

CHEMICALS OF CONCERN	SURFICIAL SOIL	SUB-SURFACE SOIL	GROUNDWATER	SOIL-VAPOR
	Inhalation of Vapors and Particulates, Dermal Contact, and Accidental Ingestion	Indoor Inhalation of Vapor Emissions	Indoor Inhalation of Vapor Emissions	Indoor Inhalation of Vapor Emissions
	Representative Concentration [mg/kg]	Representative Concentration [mg/kg]	Representative Concentration [mg/L]	USE OF SOIL-VAPOR DATA IS NOT ALLOWED UNDER RE-1
1,2-Dichloroethane	1.00E-02	6.00E-04		
Benzene	1.00E-02	1.50E+01	6.20E-02	
Ethylbenzene	1.00E-02	4.90E+01	5.20E-02	
Ethylene dibromide(EDB)	1.00E-02	6.00E-04		
MTBE	1.00E-02	6.00E-04	1.20E-02	
Naphthalene	1.00E-02	1.80E+01	3.80E-02	
Toluene	1.00E-02	1.50E+02	5.60E-02	
Total Xylenes	1.00E-02	2.39E+02	2.41E-01	

Note: Source Data from Kleinfelder Soil Boring Investigation, December 2006

RE-1 RISK/HAZARD QUOTIENT FOR RESIDENTIAL RECEPTORS

CHEMICALS OF CONCERN	CHILD								AGE-ADJUSTED							
	SURFICIAL SOIL		SUB-SURFACE SOIL		GROUNDWATER		SOIL-VAPOR		SURFICIAL SOIL		SUB-SURFACE SOIL		GROUNDWATER		SOIL-VAPOR	
	Inhalation of Vapors and Particulates, Dermal Contact, and Accidental Ingestion		Indoor Inhalation of Vapor Emissions		Indoor Inhalation of Vapor Emissions		Indoor Inhalation of Vapor Emissions		Inhalation of Vapors and Particulates, Dermal Contact, and Accidental Ingestion		Indoor Inhalation of Vapor Emissions		Indoor Inhalation of Vapor Emissions		Indoor Inhalation of Vapor Emissions	
	Risk	HQ	Risk	HQ	Risk	HQ	Risk	HQ	Risk	HQ	Risk	HQ	Risk	HQ	Risk	HQ
1,2-Dichloroethane			5.88E-08	5.38E-03							2.99E-08	5.48E-04				
Benzene			4.37E-04	3.30E+01	4.13E-07	3.11E-02					1.48E-04	2.23E+00	6.98E-07	1.05E-02		
Ethylbenzene			NTOX	2.28E+00	NTOX	9.71E-04					NTOX	2.16E-01	NTOX	3.28E-04		
Ethylene dibromide(EDB)			2.62E-07	6.96E-02							2.53E-07	1.35E-02				
MTBE			1.31E-10	5.06E-06	2.71E-10	1.05E-05					1.15E-10	8.91E-07	4.57E-10	3.55E-06		
Naphthalene			NTOX	9.70E+00	NTOX	1.68E-02					NTOX	3.26E+00	NTOX	5.69E-03		
Toluene			NTOX	9.91E-01	NTOX	9.91E-05					NTOX	6.70E-02	NTOX	3.35E-05		
Total Xylenes			NTOX	9.94E+01	NTOX	4.07E-02					NTOX	1.05E+01	NTOX	1.37E-02		

Notes:

NPCP: A physical-chemical parameter, required in the calculation of the value, is not available.

NTOX: The toxicity parameter(s) required in the calculation of the value, is not available.

NCOC: The chemical is not a COC for the pathway because it was selected, but no representative concentration was entered.

RE-1 RISK/HAZARD QUOTIENT FOR NON-RESIDENTIAL RECEPTORS

CHEMICALS OF CONCERN	SURFICIAL SOIL		SUB-SURFACE SOIL		GROUNDWATER		SOIL-VAPOR	
	Inhalation of Vapors and Particulates, Dermal Contact, and Accidental Ingestion		Indoor Inhalation of Vapor Emissions		Indoor Inhalation of Vapor Emissions		Indoor Inhalation of Vapor Emissions	
	Risk	HQ	Risk	HQ	Risk	HQ	Risk	HQ
1,2-Dichloroethane	3.25E-09	2.65E-04	1.65E-09	1.37E-04				
Benzene	1.10E-09	7.58E-05	1.67E-05	1.15E+00	1.39E-08	9.53E-04		
Ethylbenzene	NTOX	9.22E-07	NTOX	6.04E-02	NTOX	3.04E-05		
Ethylene dibromide(EDB)	7.44E-08	3.04E-03	7.47E-09	1.81E-03				
MTBE	7.91E-12	2.09E-07	3.74E-12	1.32E-07	8.10E-12	2.85E-07		
Naphthalene	NTOX	4.87E-05	NTOX	2.60E-01	NTOX	5.14E-04		
Toluene	NTOX	1.82E-07	NTOX	3.45E-02	NTOX	3.05E-06		
Total Xylenes	NTOX	7.96E-06	NTOX	2.63E+00	NTOX	1.28E-03		

Notes:

NPCP: A physical-chemical parameter, required in the calculation of the value, is not available.

NTOX: The toxicity parameter(s) required in the calculation of the value, is not available.

NCOC: The chemical is not a COC for the pathway because it was selected, but no representative concentration was entered.

RE-1 RISK/HAZARD QUOTIENT FOR CONSTRUCTION WORKERS

CHEMICALS OF CONCERN	SURFICIAL SOIL	
	Inhalation of Vapors and Particulates, Dermal Contact, and Accidental Ingestion	
	Risk	HQ
1,2-Dichloroethane	1.91E-08	1.03E-02
Benzene	1.30E-09	5.89E-04
Ethylbenzene	NTOX	7.23E-04
Ethylene dibromide(EDB)	9.54E-09	3.22E-03
MTBE	4.35E-11	8.10E-06
Naphthalene	NTOX	1.95E-02
Toluene	NTOX	7.81E-05
Total Xylenes	NTOX	5.30E-02

Notes:
NPCP: A physical-chemical parameter, required in the calculation of the value, is not available.

NTOX: The toxicity parameter(s) required in the calculation of the value, is not available.
NCOC: The chemical is not a COC for the pathway because it was selected, but no representative concentration was entered.

RE-1 SUMMARY OF CUMULATIVE RISK AND HAZARD INDEX

Routes of Exposure	RECEPTOR							
	RESIDENTIAL				NON-RESIDENTIAL		CONSTRUCTION WORKER	
	CHILD		AGE-ADJUSTED					
	Risk	Hazard Index	Risk	Hazard Index	Risk	Hazard Index	Risk	Hazard Index
Surface Soil: Inhalation of Vapors and Particulates, Dermal Contact, and Accidental Ingestion	NA	NA	NA	NA	7.87E-08	3.44E-03	3.00E-08	8.75E-02
Subsurface Soil: Indoor Inhalation of Vapor Emissions	4.38E-04	1.45E+02	1.48E-04	1.63E+01	1.67E-05	4.14E+00	Not Applicable	Not Applicable
Groundwater: Indoor Inhalation of Vapor Emissions	4.13E-07	8.97E-02	6.99E-07	3.03E-02	1.39E-08	2.78E-03	Not Applicable	Not Applicable
Soil-Vapor: Indoor Inhalation of Vapor Emissions from Soil and/or Groundwater	NA	NA	NA	NA	NA	NA	Not Applicable	Not Applicable
Site Risk	**4.38E-04**		**1.49E-04**		**1.68E-05**		**3.00E-08**	
Site Hazard Index		**1.45E+02**		**1.63E+01**		**4.14E+00**		**8.75E-02**
RATL-1/RATL-2 Required?	YES	YES	YES	YES	YES	YES	NO	NO

Notes:
NA: Not applicable because the chemical is not a COC for the pathway (no representative concentration entered) or its properties (toxicity and/or physical-chemical) are not available.

RATL-1 FOR RESIDENTIAL RECEPTORS

CHEMICALS OF CONCERN	CHILD				AGE-ADJUSTED			
	SURFICIAL SOIL	SUB-SURFACE SOIL	GROUNDWATER	SOIL-VAPOR	SURFICIAL SOIL	SUB-SURFACE SOIL	GROUNDWATER	SOIL-VAPOR
	Inhalation of Vapors and Particulates, Dermal Contact, and Accidental Ingestion	Indoor Inhalation of Vapor Emissions	Indoor Inhalation of Vapor Emissions	Indoor Inhalation of Vapor Emissions	Inhalation of Vapors and Particulates, Dermal Contact, and Accidental Ingestion	Indoor Inhalation of Vapor Emissions	Indoor Inhalation of Vapor Emissions	Indoor Inhalation of Vapor Emissions
	[mg/kg]	[mg/kg]	[mg/L]	[ug/m3]	[mg/kg]	[mg/kg]	[mg/L]	[$\mu g/m^3$]
1,2-Dichloroethane	NA	7.96E-03	NA	NA	NA	3.34E-02	NA	NA
Benzene	NA	3.25E-02	1.42E-01	NA	NA	1.69E-01	1.48E-01	NA
Ethylbenzene	NA	1.53E+00	3.83E+00	NA	NA	1.62E+01	1.13E+01	NA
Ethylene dibromide(EDB)	NA	6.16E-04	NA	NA	NA	3.19E-03	NA	NA
MTBE	NA	7.66E+00	7.39E+01	NA	NA	8.70E+00	4.37E+01	NA
Naphthalene	NA	1.33E-01	1.61E-01	NA	NA	3.94E-01	4.77E-01	NA
Toluene	NA	1.08E+01	4.04E+01	NA	NA	1.60E+02	1.19E+02	NA
Total Xylenes	NA	1.72E-01	4.23E-01	NA	NA	1.62E+00	1.25E+00	NA

Notes:
NA: Not applicable because the chemical is not a COC for the pathway (no representative concentration entered) or its properties (toxicity and/or physical-chemical) are not available.

RATL-1 FOR NON-RESIDENTIAL RECEPTORS

CHEMICALS OF CONCERN	SURFICIAL SOIL	SUB-SURFACE SOIL	GROUNDWATER	SOIL-VAPOR
	Inhalation of Vapors and Particulates, Dermal Contact, and Accidental Ingestion	Indoor Inhalation of Vapor Emissions	Indoor Inhalation of Vapor Emissions	Indoor Inhalation of Vapor Emissions
	[mg/kg]	[mg/kg]	[mg/L]	[µg/m^3]
1,2-Dichloroethane	1.72E+00	1.99E-01	NA	NA
Benzene	6.00E+00	5.95E-01	2.96E+00	NA
Ethylbenzene	4.93E+02	3.69E+01	7.77E+01	NA
Ethylene dibromide(EDB)	1.34E-01	1.51E-02	NA	NA
MTBE	1.26E+03	1.60E+02	1.48E+03	NA
Naphthalene	9.33E+00	3.15E+00	3.36E+00	NA
Toluene	2.50E+03	1.98E+02	8.36E+02	NA
Total Xylenes	5.71E+01	4.13E+00	8.59E+00	NA

Notes:

NA: Not applicable because the chemical is not a COC for the pathway (no representative concentration enetered) or its properties (toxicity and/or physical-chemical) are not available.

RATL-1 FOR CONSTRUCTION WORKERS

RATLs NOT REQUIRED

CHEMICALS OF CONCERN	SURFICIAL SOIL Inhalation of Vapors and Particulates, Dermal Contact, and Accidental Ingestion [mg/kg]
1,2-Dichloroethane	4.41E+00
Benzene	1.55E+01
Ethylbenzene	1.29E+03
Ethylene dibromide(EDB)	3.88E-01
MTBE	5.63E+03
Naphthalene	2.40E+01
Toluene	6.77E+03
Total Xylenes	1.47E+02

Notes:

NA: Not applicable because the chemical is not a COC for the pathway (no representative concentration enetered) or its properties (toxicity and/or physical-chemical) are not available.

RE-1 SURFACE WATER PROTECTION

CHEMICALS OF CONCERN	Surface Water Standard [mg/L]	First-Order Decay Rate [day-1]	Retardation Factor	Unsaturated Zone DAF [--]	Mixing Zone DAF [--]	Saturated Zone DAF		Overall DAF		Allowable groundwater concentration [mg/L] protective of surface water:		Soil concentration at the source protective of surface water [mg/kg]	Predicted Groundwater Concentration at POC [mg/L]	Predicted Groundwater Concentration at Discharge to SW [mg/L]
						at POC [--]	at POE [--]	at POC [--]	at POE [--]	AT POC	AT SOURCE			
1,2-Dichloroethane	3.80E-04	0.00E+00	1.06E+00	1	1.78E+01	1.00E+00	1.00E+00	1.78E+01	1.78E+01	3.80E-04	3.80E-04	8.31E-04	0.00E+00	0.00E+00
Benzene	1.20E-03	0.00E+00	1.28E+00	1	1.78E+01	1.00E+00	1.00E+00	1.78E+01	1.78E+01	1.20E-03	1.20E-03	4.27E-03	6.20E-02	6.20E-02
Ethylbenzene	3.10E+00	0.00E+00	3.84E+00	1	1.78E+01	1.00E+00	1.00E+00	1.78E+01	1.78E+01	3.10E+00	3.10E+00	4.53E+01	5.20E-02	5.20E-02
Ethylene dibromide(EDB)	NSWSTD	0.00E+00	1.23E+00	1	1.78E+01	1.00E+00	1.00E+00	1.78E+01	1.78E+01	NSWSTD	NSWSTD	NSWSTD	NSWSTD	NSWSTD
MTBE	NSWSTD	0.00E+00	1.06E+00	1	1.78E+01	1.00E+00	1.00E+00	1.78E+01	1.78E+01	NSWSTD	NSWSTD	NSWSTD	NSWSTD	NSWSTD
Naphthalene	NSWSTD	0.00E+00	6.42E+00	1	1.78E+01	1.00E+00	1.00E+00	1.78E+01	1.78E+01	NSWSTD	NSWSTD	NSWSTD	NSWSTD	NSWSTD
Toluene	6.80E+00	0.00E+00	1.57E+00	1	1.78E+01	1.00E+00	1.00E+00	1.78E+01	1.78E+01	6.80E+00	6.80E+00	3.32E+01	5.60E-02	5.60E-02
Total Xylenes	NSWSTD	0.00E+00	3.91E+00	1	1.78E+01	1.00E+00	1.00E+00	1.78E+01	1.78E+01	NSWSTD	NSWSTD	NSWSTD	NSWSTD	NSWSTD

Notes:

NSWSTD: No surface water standard is available or calculated for the chemical